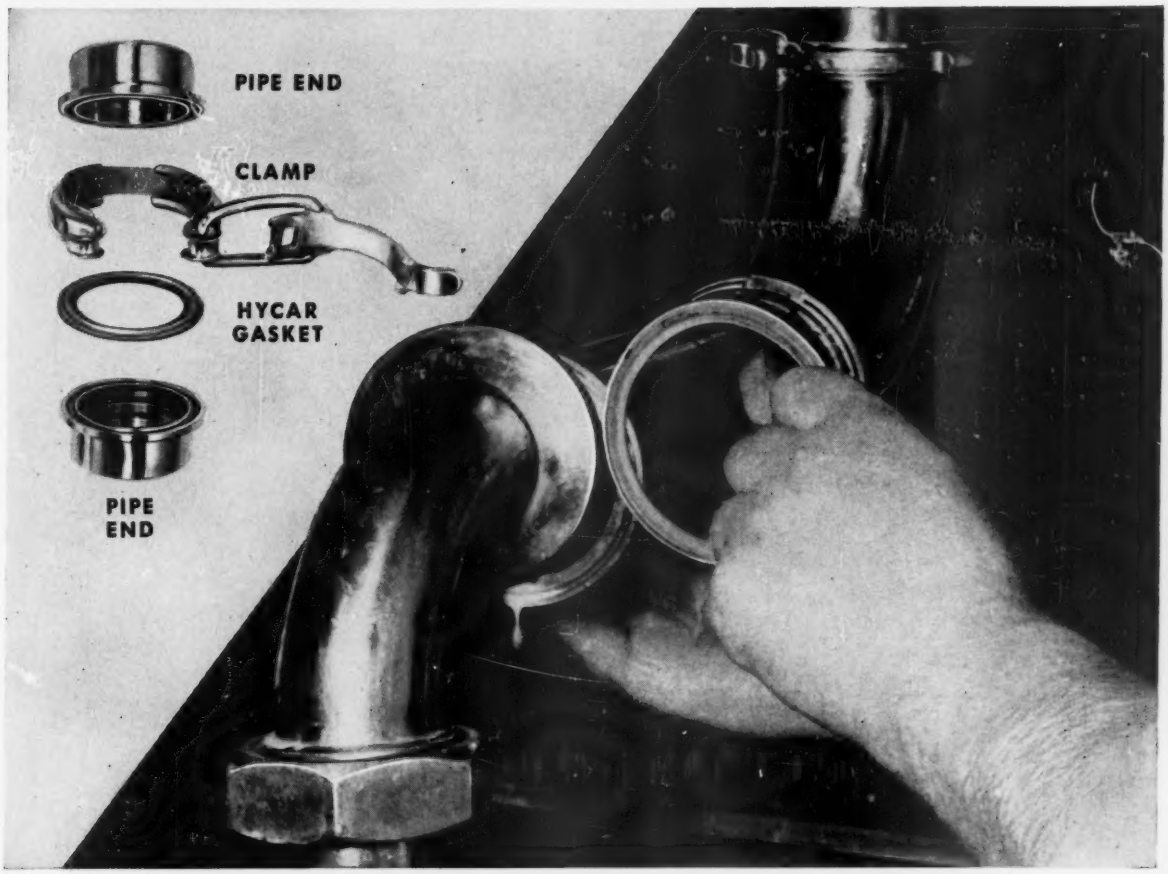
Another new development using

B. F. Goodrich Chemical *raw materials*



Tri-clamp fitting manufactured by Tri-Clover Machine Co., Kenosha, Wisconsin. B. F. Goodrich Chemical Company supplies the Hycar rubber only.

MILK PIPE SANITATION HELPED BY HYCAR GASKET

EVERYBODY knows that handling milk demands the utmost in sanitation, and one of the problems is the daily cleaning and flushing of milk pipelines. It's a job that involves high labor cost and lost time when the lines must be disassembled, cleaned and flushed after each production run.

"Cleaned-in-place" pipeline systems are making a radical cut in labor costs. CIP lines, using the specially designed clamp pictured here, can cut labor costs as much as 60 per cent. The clamp contains a gasket made from Hycar rubber that effectively seals the pipe joints; the lines may be cleaned simply by flushing, without disassembly. Compounded to be non-toxic, the Hycar gasket neither contaminates the milk, nor deteriorates in alkaline or acidic cleaning fluids.

Versatile Hycar rubber compounds are used in many ways, in many industries. Hycar resists oil, grease, many chemicals and abrasion, and is not affected by extreme pressures or temperatures. Nor will Hycar distort or cold flow. If these advantages point a way for Hycar to help you improve or develop a product, we'll help you with technical advice. For information, please write Department HB-10, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U.S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

Rubber troubles? Feeling blue?
The **Philblacks*** *know just what to do!*

All Worn Out? Philblack E adds up to 42% more abrasion resistance to synthetic rubber tire treads. Works wonders in making rubber tougher, longer-wearing. Excellent cut and crack growth resistance, too.

Run Down? Philblack O and Philblack E keep rubber vitally youthful . . . give remarkably long flex life.

Listless? Philblack I, the new ISAF black (Intermediate Super Abrasion Furnace) is prescribed for tread stocks that need a tonic. Gives unusually high abrasion qualities at moderate added cost.

Jumpy Nerve? *Fever?* Philblack A removes nerve; makes processing easy. Reduces heat build-up. Gives accurate moldings and smooth, fast tubings.

The Philblacks can help keep your business healthy. For full information consult our technical sales representative.

PHILLIPS CHEMICAL COMPANY

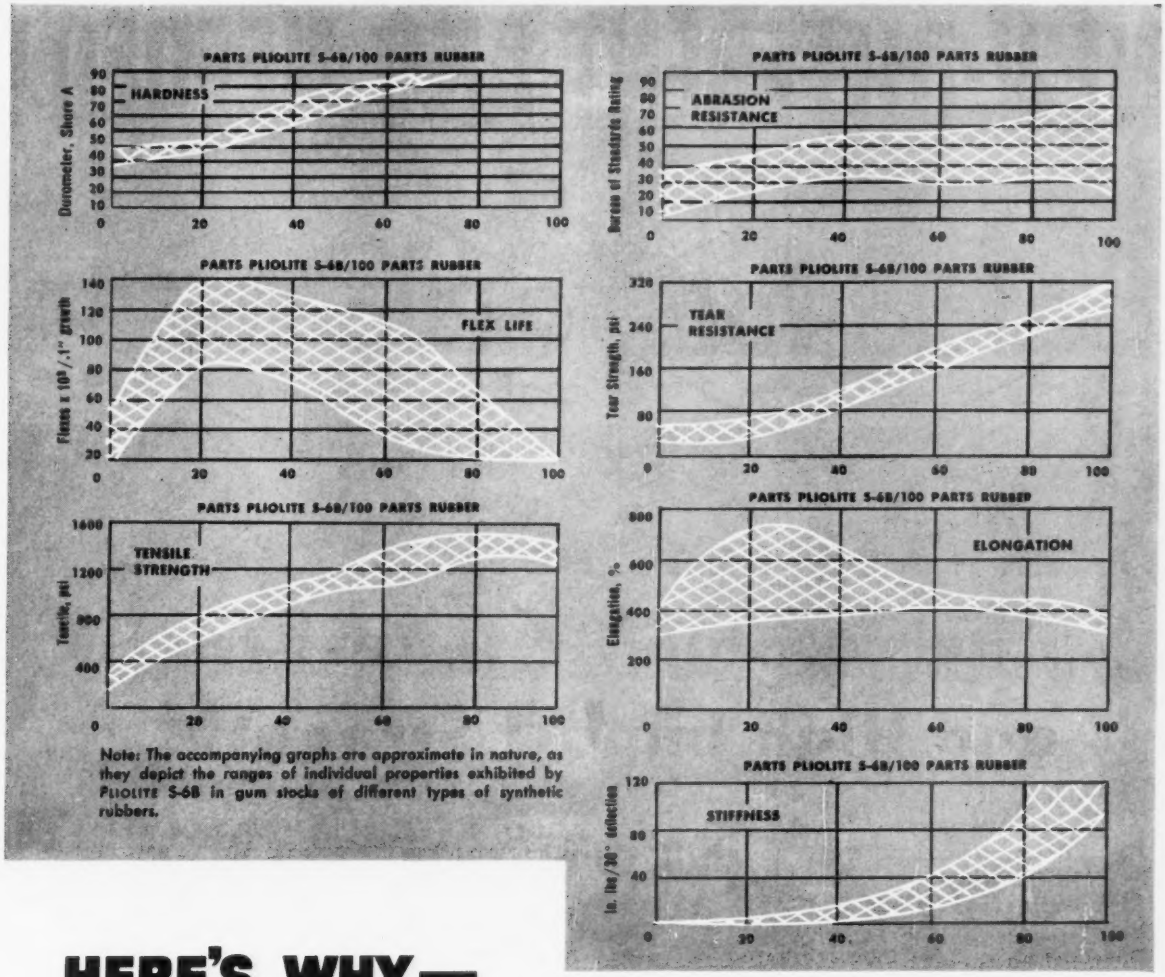
PHILBLACK SALES DIVISION

318 WATER STREET · AKRON 8, OHIO

PHILBLACK EXPORT SALES DIVISION • 80 BROADWAY • NEW YORK 5, N.Y.

* A Trademark

The Philblacks are manufactured at Borger, Texas. Warehouses in Akron, Boston, Chicago, and Trenton. West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.



Note: The accompanying graphs are approximate in nature, as they depict the ranges of individual properties exhibited by PLIOLITE S-6B in gum stocks of different types of synthetic rubbers.

HERE'S WHY—

HERE'S HOW

PLIOLITE S-6B Improves Rubber

PLIOLITE S-6B is a high styrene-butadiene copolymer resin. It is specifically designed and made to reinforce rubber. It is carefully polymerized so as to be rapidly dispersed and completely compatible with virtually any type of natural or synthetic rubber. It is the outstanding rubber reinforcing resin on today's market.

A glance at these graphs is all that's needed to show how effectively PLIOLITE S-6B hardens, strengthens and stiffens synthetic rubber. Keep in mind, too, that this use-proved resin also substantially improves abrasion resistance, flex life, tear strength, electrical properties, handling characteristics and appearance of the rubber with which it is used.

Proof of improvements possible with PLIOLITE S-6B is easily obtained on your own mills and testing equipment. You can get adequate samples and full technical information and assistance by writing to: Goodyear, Chemical Division, Akron 16, Ohio.

CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry

NEW-DIFFERENT-AND NEEDED!

Plio-Tuf G75C **Plio-Tuf G85C**

High Styrene Resins Having High Heat Resistance and High Impact Strength

Heat distortion point of 195°F. @ 66 psi (ASTM D648). Notched Izod Impact of 8 ft.-lbs./in. of notch @ 77°F. High tensile strength. Hardness. Toughness. Stiffness. Light weight. Light color. Low water absorption. Excellent chemical resistance. Excellent electrical properties. Easy processability. Ready post-formability. All these are yours—without curing—without blending with rubber—in the new PLIO-TUF G75C and PLIO-TUF G85C.

NOT A RUBBER-RESIN BLEND

PLIO-TUF G75C and G85C are two completely different high styrene copolymers recently developed by Goodyear. They are pure resins—not rubber-resin blends. PLIO-TUF G75C is designed for use alone. PLIO-TUF G85C is designed for use with G75C or various rubbers to increase hardness, tensile or heat softening points. Both are now available in quantity as white powders.

NO CURING NEEDED

PLIO-TUF G75C is easily compounded and processed. Release agents and pigments are all that are needed. Extenders may be added for lower cost. Conventional rubber or plastic mixing equipment can be used. The compounds are readily calendered, extruded or molded. Polished or embossed sheets are easily post-formed by vacuum or mechanical drawing. PLIO-TUF G85C blended with PLIO-TUF G75C exhibits similar processing characteristics.

EASILY FABRICATED

Products made from PLIO-TUF resins can be sawed, drilled, punched, tapped, turned, sewed, cemented, sanded, polished, hot stamped or painted. Typical suggested uses include luggage, carrying cases, containers, tote boxes, pipe, fittings, rods, tubes, automotive and equipment parts, housings, door panels, toys, protective helmets, kitchen utensils, handles and many other molded, post-formed or fabricated items for home and industry.

Investigate the possibilities of these challenging, new PLIO-TUF resins, today. Get full information, samples and technical assistance simply by filling out the coupon.

CHEMICAL GOODYEAR DIVISION

The Goodyear Tire & Rubber Company, Inc.
Chemical Division, Akron 16, Ohio

Please send me full details and sample of new PLIO-TUF resins.

☐ I am a fabricator interested in PLIO-TUF sheets.
☐ I am a processor interested in PLIO-TUF resins.

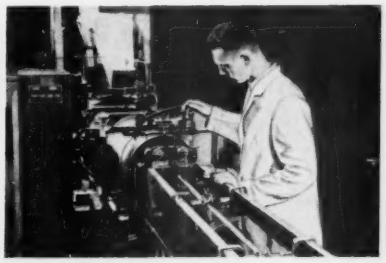
Name_____

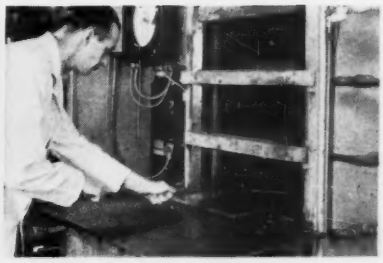
Company_____ Position_____

Address_____

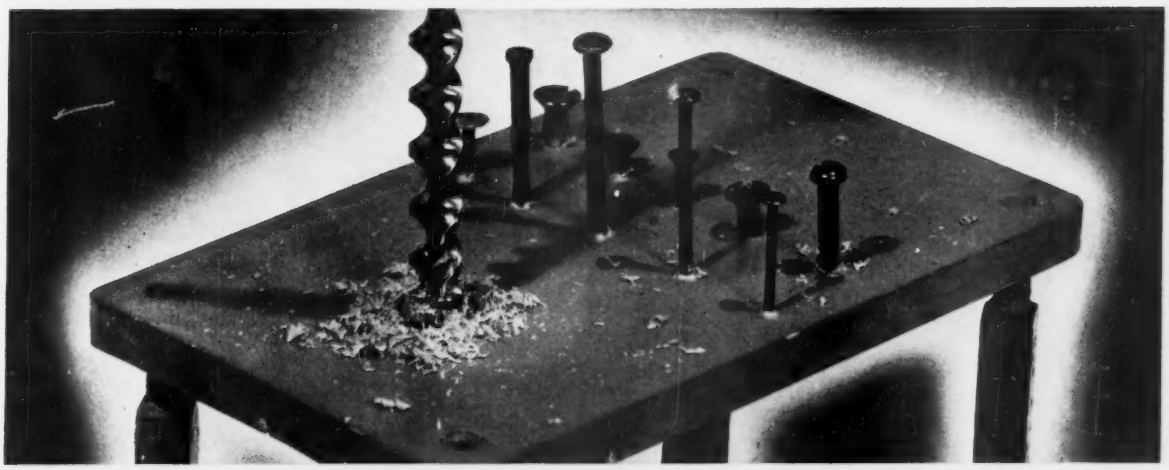
Look What You Can Do With Plio-**Tuf!**

Plio-Tuf can be compounded on conventional rubber or plastic mixing equipment.

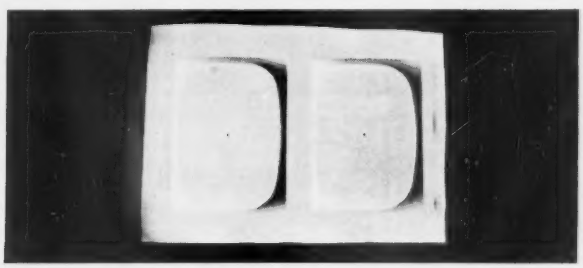




Plio-Tuf can be calendered, extruded, compression or transfer molded.



Plio-Tuf can be sawed, punched, drilled, tapped, turned, sewed, cemented, sanded, polished, hot stamped, painted.



Plio-Tuf sheets are tough, flexible—readily post-formed into items such as television masks.

We think you'll like "THE GREATEST STORY EVER TOLD"— every Sunday—ABC Radio Network
THE GOODYEAR TELEVISION PLAYHOUSE— every other Sunday—NBC TV Network

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic, Wing-Stay—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry

SPECIAL PRODUCTS

34 YEARS of Chemical Service to the Rubber Trade!

- Para-Flux
- Para Lube
- Aro-Lene 1980
- 2016 Para-Flux
- Sponge Paste
- Rubber-Glo
- MODX
- MODX-B
- PHENEX
- SPDX-GH
- SPDX-GL
- Flexible Paint
- Stabilite
- Stabilite Alba
- Stabilite White
- Retardex
- SYN-TAC
- Para Resins

TECHNICAL AND COMPOUNDING MATERIALS

- Antioxidants
- Activators
- Fillers
- Curing Agents
- Dusting Powders
- Accelerators
- Acids
- Alkalies
- Plasticizers
- Low Temperature Plasticizers
- Factice
- Reinforcing Agents
- Fluxes
- Reclaiming Oils
- Abrasives
- Solvents
- Oxiaes
- Esters
- Mold Lubricants

AKRON, OHIO • LOS ANGELES, CALIF. • CHICAGO, ILLINOIS • NEWARK, N. J.

RUBBER FABRICATORS NEED ACCURATE CUTTING DIES

For Cutting

Rubber, Neoprene, Plastics, etc.
Sheeting, Foam, Sponge, Cellular,
Cured & Uncured

Gang Dies Our Specialty

- **Accuracy to close Tolerances**
- **Durability**
- **Genuine Understanding of the problems of rubber goods manufacturers**

MALLET HANDLE DIES

PURPOSE — For those who have no machinery and do not wish to purchase any. For Cutting — Rubber, Neoprene, Plastics, etc.

ADVANTAGE — Cut direct from bolts or not.

SERVICE—One to three days.

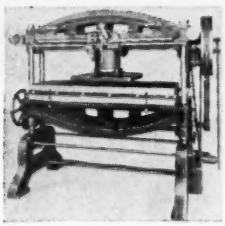
STEEL RULE CUTTING DIES

Used on Die Cutting Press, Printing Press or Power Press

PURPOSE — Especially suited for cutting — Rubber, Neoprene, Plastics, etc.

ADVANTAGE—Low in cost. Suitable for long production runs. It is necessary to cut from rectangular sheets which are fed into the press.

SERVICE—One day service.,



STEEL RULE CLICKER DIES

Use On Clicker Machine or Dinker Press

PURPOSE—For Cutting Rubber, Neoprene, Plastics, etc.

ADVANTAGE — More reasonably priced than the all steel dies. Recommended for small and medium quantities where cost of an all steel die is not warranted.

SERVICE—One day service.

ALL STEEL DIES

Use On Clicker Machine or Beam Press or Power Press

PURPOSE—For Cutting—Rubber, Neoprene, Plastics, etc.

ADVANTAGE — Cut direct from rolls without first cutting into sheets.

SERVICE—One to three day service on dies.

DIE CUTTING SERVICE

PURPOSE—For those who prefer to have their cutting done by others.

ADVANTAGE—We can die cut your product for you on our own presses rapidly and economically at a low "per thousand" cost.

SERVICE—One to three days.

Dies for cutting
Gaskets, flashing from molded parts, rubber soles, foam and sponge for furniture padding, inflated toys, clothing and footwear, etc.

SAME DAY SERVICE

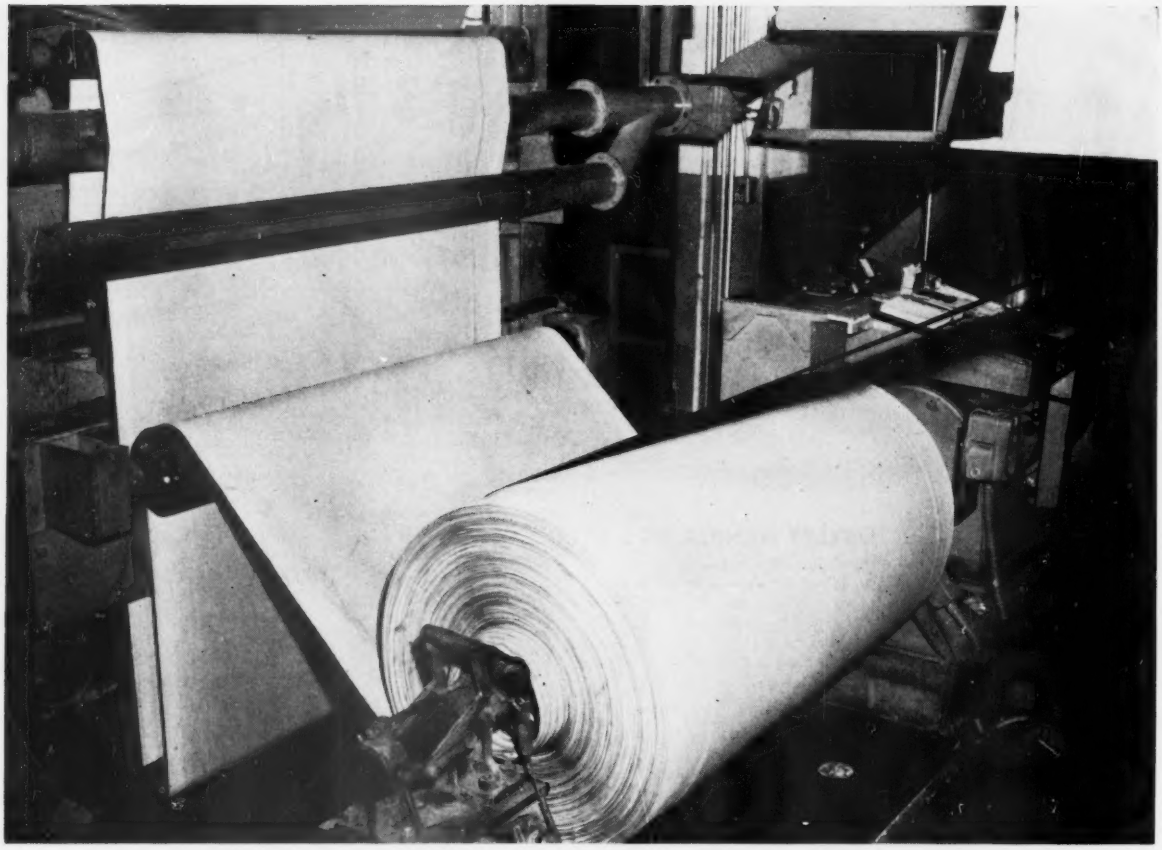
ACCURATE

STEEL RULE DIE MANUFACTURERS

24-28 West 21st Street, New York 10, N. Y. CHelsea 2-0860-1

Subsidiaries: American Fabricators; Interstate Die Cutting Co., Inc.

Intelligent Service to the Rubber Goods Industry for Over 22 Years



CLIMCO PROCESSED LINERS

Pay Off—In Any Width

Regardless of the width of your stock, roll it into a Climco Processed Liner when it leaves the calender. For handling any size stock, Climco Processed Liners pay off in faster, lower cost production.

Climco Processed Liners preserve tackiness, eliminate lint and ravelings. And new minimums are established for stock losses because gauge distortion is permanently eliminated. Climco Processed Liners help keep production going smoothly. Climco Processing—for more than 31 years giving the rubber industry a superior liner—is carefully applied by expert craftsmen using only proved ingredients. As a result, your liners last longer—years longer.

Try Climco Processed Liners in your plant. Find out why more and more companies in the rubber industry are standardizing on Climco.

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 27, Ohio

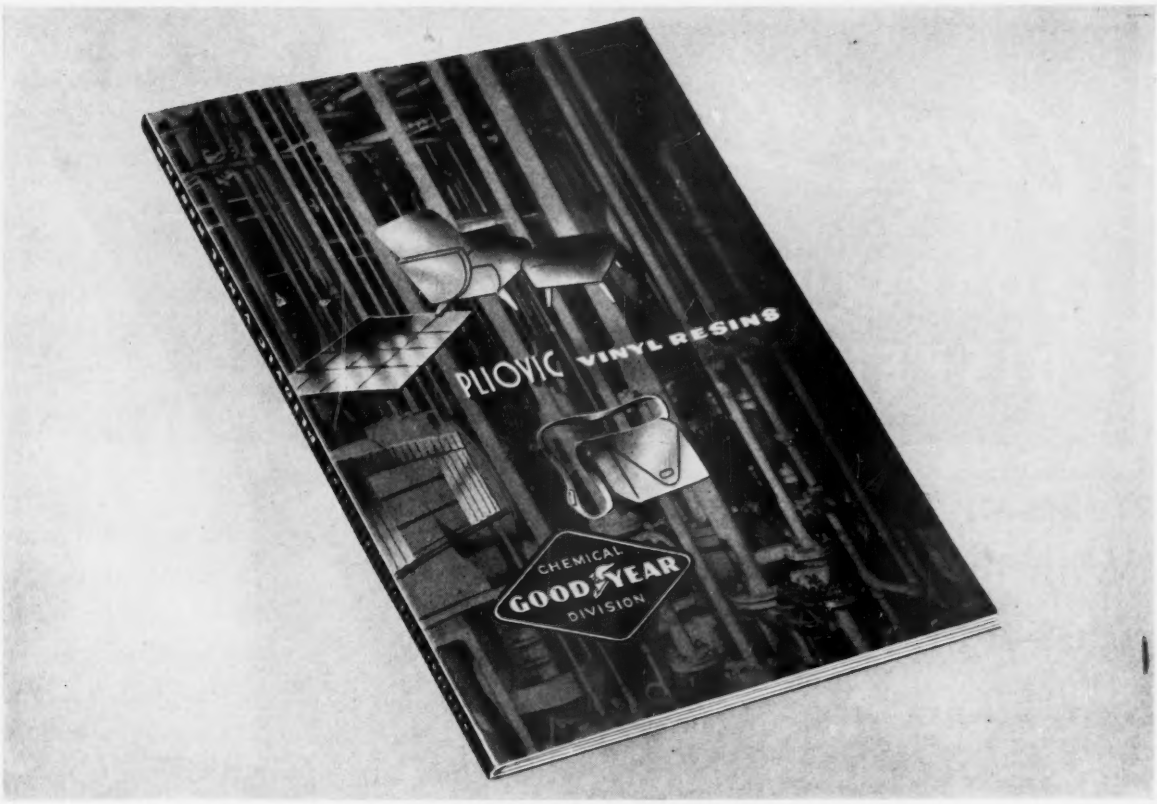
GET THE FULL STORY ON CLIMCO PROCESSING

Illustrated booklet tells about Climco Liners and Linerette separating paper. Tells how to get better service from liners. Write for your copy now.

LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS
FOR FASTER, BETTER PRODUCTION AT LOWER COST

THE CLEVELAND LINER & MFG. CO. TRADE CLIMCO MARK CLEVELAND OHIO, U.S.A.



NEW AID to better vinyl products—**IT'S FREE!**

HERE'S a big, new help for you toward improving your products made with vinyl resins. It's a factual, 52-page, illustrated, technical manual—just off the press—that gives you full, fast-reading information on PLIOVIC—Goodyear's series of superior polyvinyl chloride resins.

What PLIOVIC is—where to use it—how to compound it—how to process it—what end properties you can expect—these are just some of the important questions answered in this easily read booklet which, incidentally, is but one example of the extra service Goodyear gives you on PLIOVIC.

You will find it well worth while to receive—and read—this informative manual. Just as you find it well worthwhile to sample and use easy processing PLIOVIC in the manufacture of any high quality calendered, extruded or molded product. For the new booklet, samples and full technical assistance, write to:

Goodyear, Chemical Division
Akron 16, Ohio

We think you'll like "THE GREATEST STORY EVER TOLD"
every Sunday—ABC Radio Network
THE GOODYEAR TELEVISION PLAYHOUSE
every other Sunday—NBC TV Network

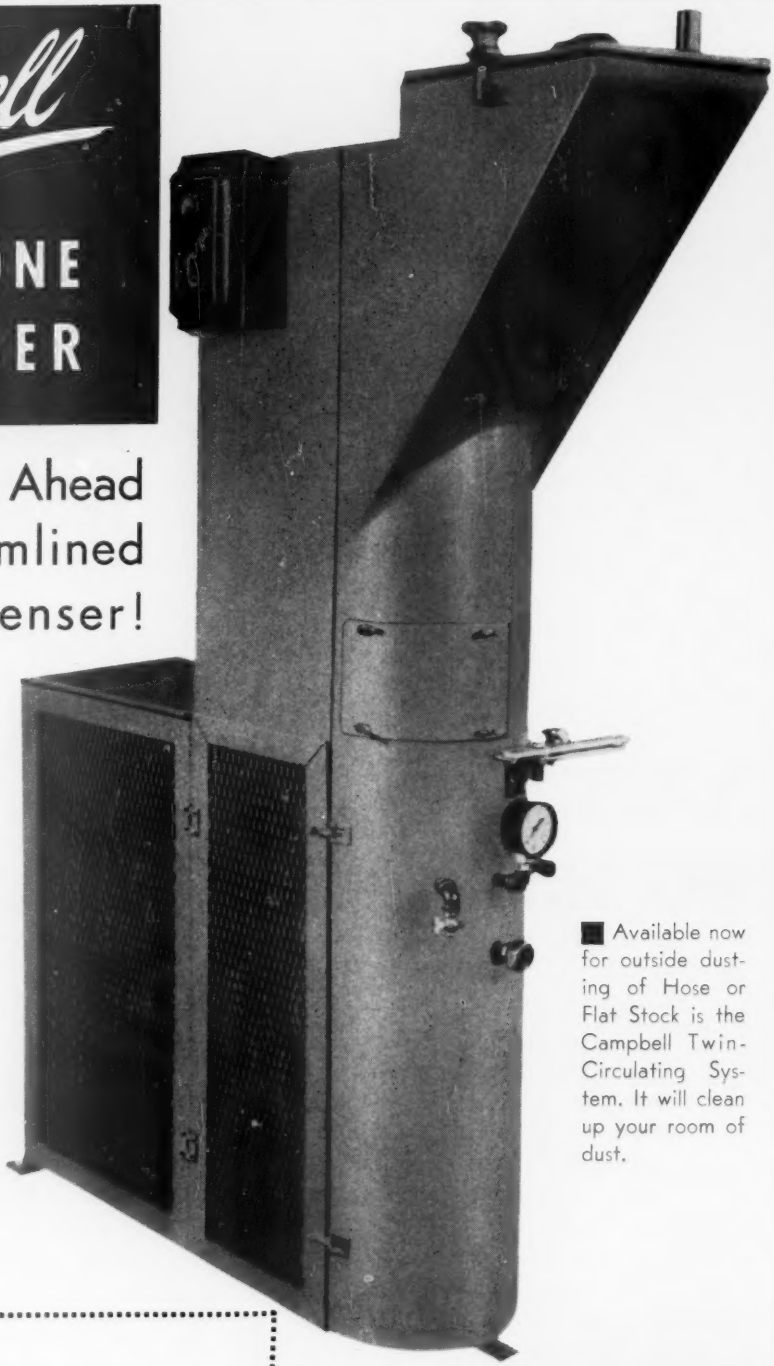
CHEMICAL
GOODYEAR
DIVISION

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Use-Proved Products—CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS—The Finest Chemicals for Industry

Campbell SOAPSTONE DISPENSER

Years of Service Ahead With this Streamlined Dust-tight dispenser!



Many companies extruding hose, tubing, etc., now rely exclusively upon the Campbell 1404-8 Dry Soapstone Dispenser for satisfactory service.

This Dispenser makes its own air or attaches to factory air lines. Its ejecting capacity is easily regulated from 3 ounces to 40 pounds per hour and the dust-tight and moisture-proof reservoir keeps the dusting operation clean and efficient. No break-downs caused by moisture-laden dusting material.

■ Available now for outside dusting of Hose or Flat Stock is the Campbell Twin-Circulating System. It will clean up your room of dust.

Send This Coupon

Falls Engineering & Machine Co.,
Cuyahoga Falls, Ohio

Please send: ☐ Folder and prices on Soapstoner; ☐ I am also interested in V-Belt Equipment; ☐ Also send information on the Campbell Power Roller Die Cutter.

Name .....

Company .....

Street .....

City & Zone ..... State .....

The FALLS ENGINEERING AND MACHINE CO.

Established 1917

1734 FRONT ST., CUYAHOGA FALLS, O.

WHICH one of these Stearic Acids can do a better job for you?

Among the almost infinite variety of high quality fatty acids produced in volume by DREW, these Stearic Acids are the outstanding choice of leaders in the rubber, paint, drug and cosmetic industries. Look at the table, and compare the composition and characteristics of these Drew Stearics with others. You may discover a clue to making your product better, at lower cost.

FORMULA 1500 Economical hydrogenated undistilled stearic, particularly suited for the rubber industry. Activates acceleration in rubber compounding.

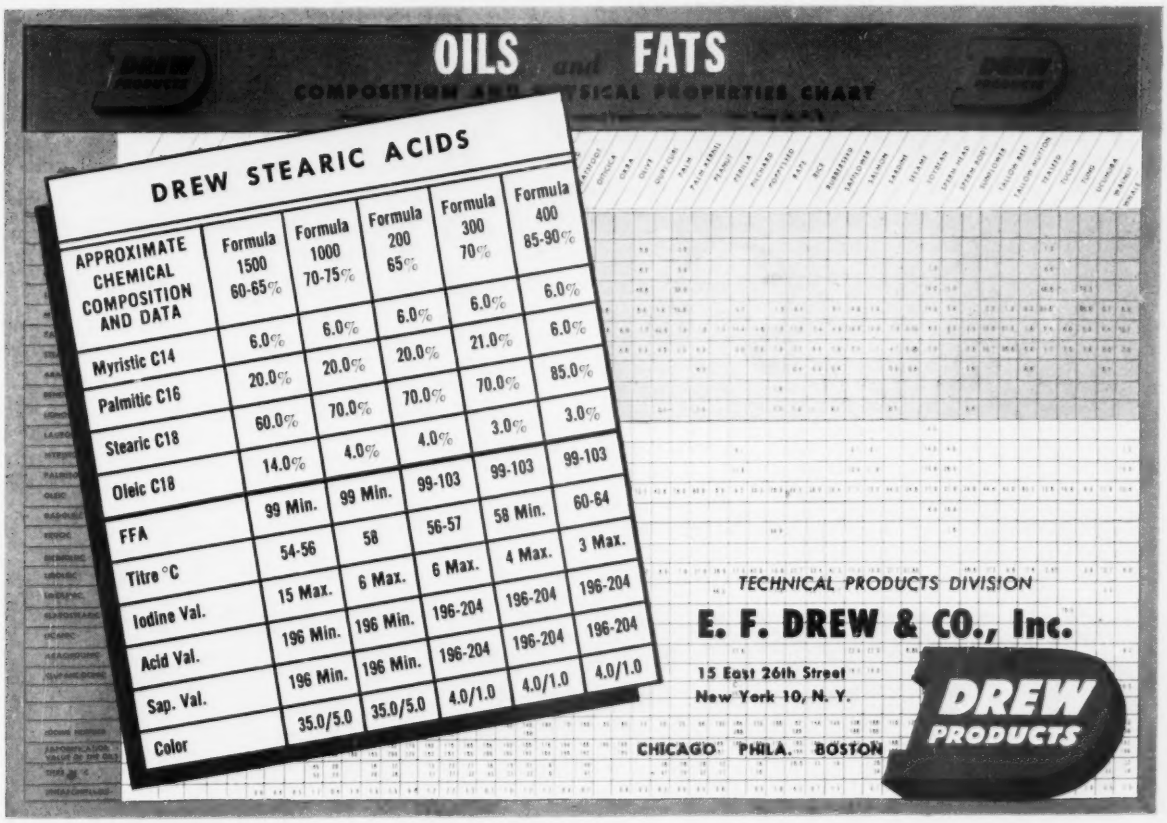
FORMULA 1000 Similar to Formula 1500, but has a higher titre and lower iodine value. Widely used in the rubber industry, and for buffing compounds.

FORMULA 200 Equivalent to double pressed stearic. Excellent for production of non-ionic emulsifiers, metallic soaps. Available in small, non-sticking, easy-to-weigh flakes.

FORMULA 300 Equivalent to triple pressed stearic. Premium grade—for the most exacting specifications in hand lotions, creams, deodorants, brushless shaving creams, mascara, etc.

FORMULA 400 An all vegetable product with exceptionally high titre and low iodine value. Use whenever specifications are more critical than those met by other stearic acids.

Send for New Folder on DREW FATTY ACIDS, including data on surfactants, plasticizers and many other products produced by Drew to help give your formulations a head start in the marketing race.



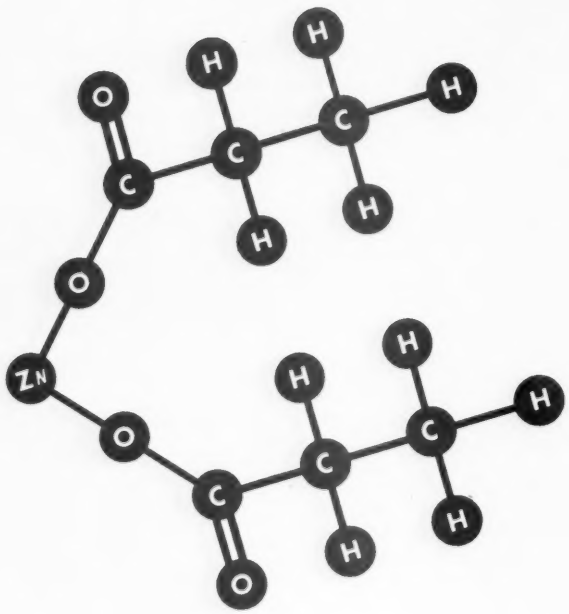
APPROXIMATE CHEMICAL COMPOSITION AND DATA	Formula 1500 60-65%	Formula 1000 70-75%	Formula 200 65%	Formula 300 70%	Formula 400 85-90%
Myristic C14	6.0%	6.0%	6.0%	6.0%	6.0%
Palmitic C16	20.0%	20.0%	20.0%	21.0%	6.0%
Stearic C18	60.0%	70.0%	70.0%	70.0%	85.0%
Oleic C18	14.0%	4.0%	4.0%	3.0%	3.0%
FFA	99 Min.	99 Min.	99-103	99-103	99-103
Titre °C	54-56	58	56-57	58 Min.	60-64
Iodine Val.	15 Max.	6 Max.	6 Max.	4 Max.	3 Max.
Acid Val.	196 Min.	196 Min.	196-204	196-204	196-204
Sap. Val.	196 Min.	196 Min.	196-204	196-204	196-204
Color	35.0/5.0	35.0/5.0	4.0/1.0	4.0/1.0	4.0/1.0

ACTIVATOR NEWS

HORSE HEAD PRODUCTS

A supplement to THE ACTIVATOR—the house organ issued by The New Jersey Zinc Company for over 15 years to aid the Rubber Industry in its use of Zinc Oxide.

FAVORED FORMULA FOR FASTER PROCESSING of ZINC OXIDE



Introduced to the Rubber Industry just a few years ago, this chemical (zinc propionate) is already the most favored processing and dispersion aid for zinc oxide.

It is available to the Rubber Industry in the form of a coating on zinc oxide, favorably modifying its physical properties without interfering with its activating characteristics.

Zinc propionate is formed as a coating on zinc oxide when the latter is treated with propionic acid at an elevated temperature. This coating forms around the individual particles, modifying their characteristics in these 3 ways:

1. **Prevents formation of aggregates—aids dispersion and reinforcement.**
2. **Provides faster wetting by rubber—cuts mixing time.**
3. **Adds plasticizing effect—speeds processing.**

These advantages, available only in Protox* zinc oxide, are proved by many manufacturers, as Protox is today the most widely used brand of zinc oxide. As one Banbury operator puts it, Protox-166 "streaks in" or "smears into the rubber" while untreated zinc oxide "spots in."

*U.S. Patents 2,303,329 and 2,303,330

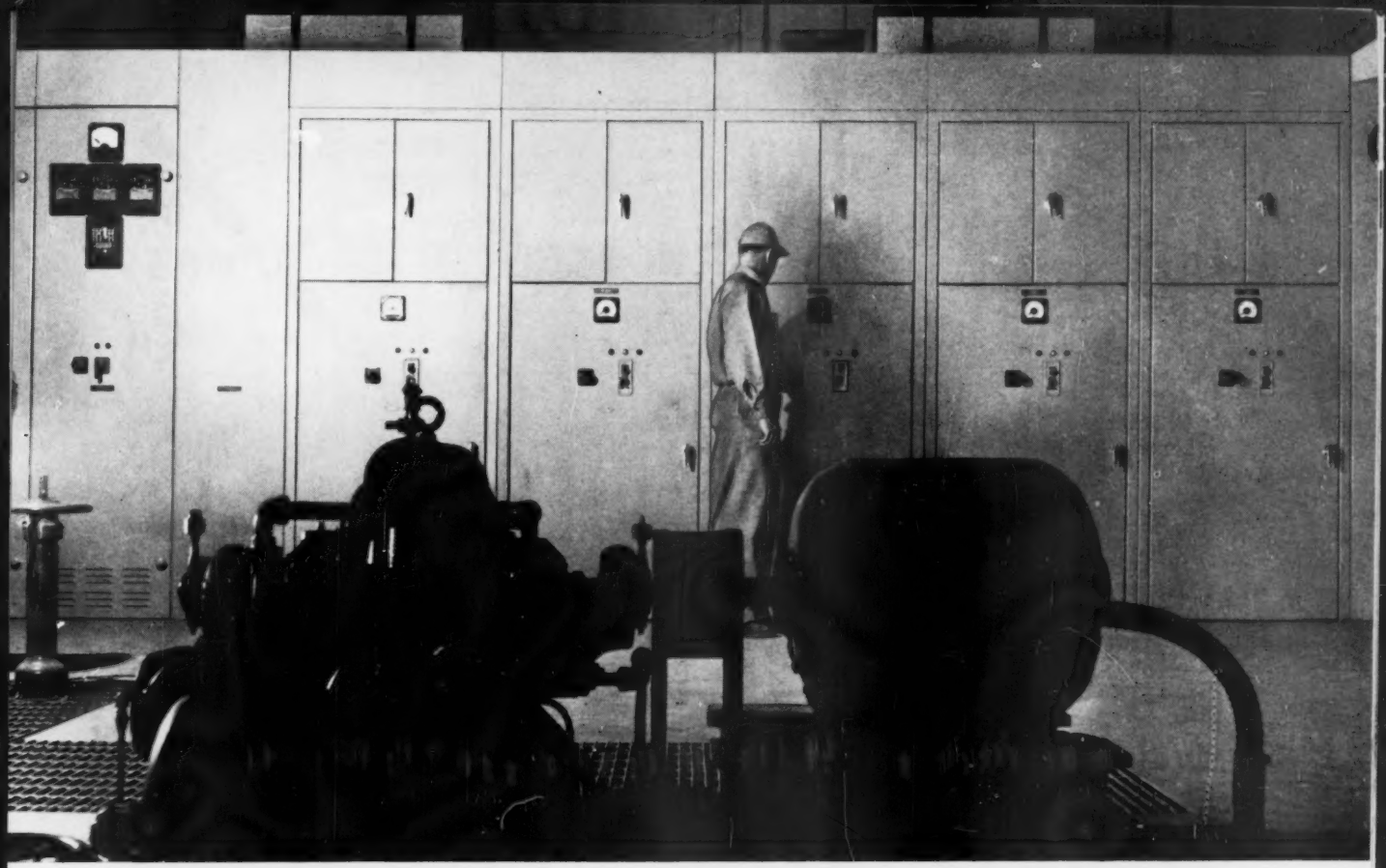
THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

... most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

HORSE HEAD PRODUCTS



G-E LIMITAMP CONTROL stands ready to check short-circuit conditions from high-voltage overloads on synchronous and induction motors up to 4800 volts. Limitamp's high interrupting capacity prevents equipment damage and costly shutdowns.

G-E Limitamp Control means "safety first" for personnel and high-voltage equipment

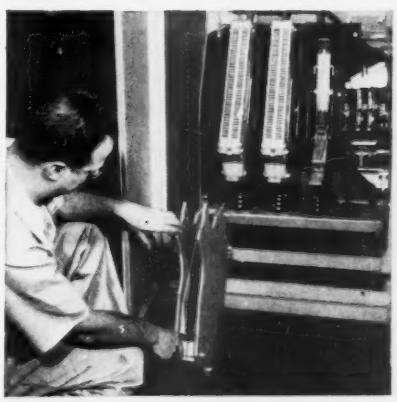
PROTECT YOUR EQUIPMENT from the explosive and shattering effects of sudden electrical overloads with General Electric Limitamp control . . . and be assured of equipment protection against short-circuit conditions up to 250,000 kva.

With General Electric Type EJ-2 fuses, fault current is limited in less than ¼ cycle . . . and the air-break contactor offers rugged service for millions of operations.

SAFEGUARD YOUR PERSONNEL by taking advantage of G-E Limitamp's "safety first" features. High- and low-voltage compartments are separated by a steel barrier. A mechanical door interlock assures opening of the motor circuit before the fuse compartment can be opened.

FOR YOUR OWN REQUIREMENTS, individual components need not be specified. Our application engineers select the correct components to give you proper control and sufficient interrupting capacity.

FOR COMPLETE INFORMATION about G-E Limitamp controls and how your particular operation can benefit, contact your nearby General Electric Apparatus Sales Office, or write Section 781-6 for Bulletin GEA-5409 today. *General Electric Company, Schenectady 5, New York.*

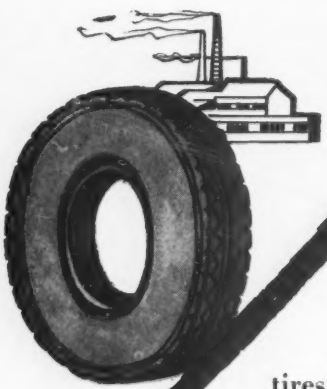


EASY TO MAINTAIN. Arc shutes are easily removed, contact tips quickly inspected, and G-E Limitamp is back on the job.

You can put your confidence in—

GENERAL ELECTRIC

Two lanes on the road to PROGRESS



Today's mighty rayon tires are being improved two ways—by the producers of rayon and by the makers of the finished tires. Day in and day out, research and experimentation goes on in the rayon laboratories. Greater toughness and even greater flex life are gained by controlling the materials and methods of production. For rayon is man-made and can be controlled for man's benefit. Better methods of utilizing improved rayon cord are the business of the tire manufacturing industry, who follow through with advances of their own. The end result is a two-fold gain: A double reason why the importance of rayon tires continues to soar—year after year.

Enka is a major producer of Rayon for tires.

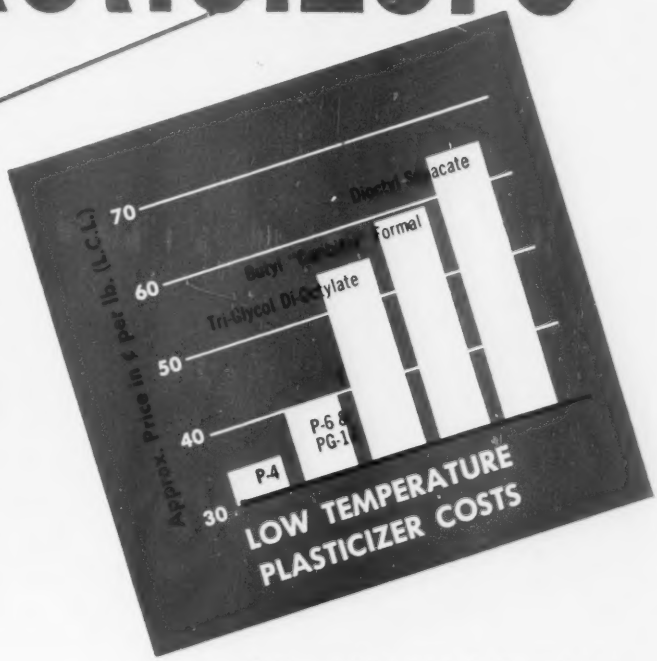
ENKA RAYON FOR CORD IN TIRES

American Enka Corporation, 206 Madison Avenue, New York 16, N. Y.

HOW TO CUT COSTS ON LOW TEMPERATURE / LOW VOLUME SWELL

SYNTHETIC RUBBER Plasticizers

FLEXRICIN® plasticizers are fully equivalent and, in many cases, superior to the commonly used low temperature plasticizers. Added features are their extremely low volume swell in aromatic fuels and excellent recovery on low temperature compression set. Their cost is much lower. Check this graphic comparison and you will see that costs can be cut substantially.



Flexricin Rubber Plasticizers:

PG-16, Butyl Acetyl Polyricinoleate	25% Nitrile Rubber
FLEXRICIN P-4, Methyl Acetyl Ricinoleate	40% Nitrile Rubber
FLEXRICIN P-6, Butyl Acetyl Ricinoleate	Neoprene GN
FLEXRICIN P-4, Methyl Acetyl Ricinoleate	GRS

ESTABLISHED 1857

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Please send samples of the Ricinoleate Esters checked or Technical Bulletin.

☐ **PG-16** ☐ **P-4** ☐ **P-6**

☐ **Technical Data**

Name_____

Firm_____

Address_____

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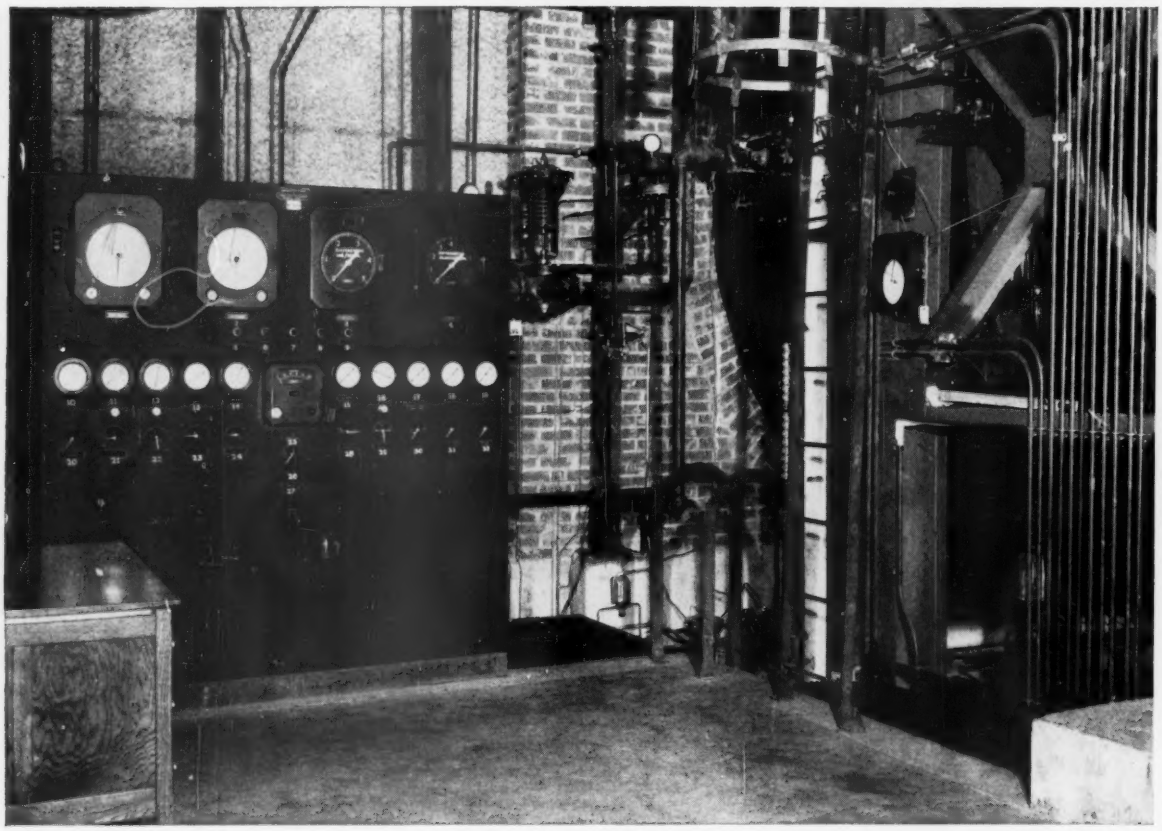
RA-103

How to cure a FLYING GAS TANK



Goodyear of Akron, Ohio, has found the answer. It uses a giant 45 ft. long by 15 ft. diameter Adamson heater, automatically controlled from start to finish of the cure by Taylor instruments. This mammoth vulcanizer, used for curing self-sealing gas tanks for aircraft, also large rubber life rafts, is operated by pushing a button. Goodyear is confident of uniform results, safe operation.

HERE'S HOW IT WORKS:

1. Push button closes door, locks it, turns on signal light.

2. Taylor FLEX-O-TIMER* Time Cycle Controller admits air to the FULSCOPE* Recording Temperature Controller, shuts the drain valves, applies air to seat door gasket. Then timer stops.

3. As temperatures reach control point, the timer again starts to accurately regulate the cure period.

4. At end of cure, it turns air off controllers, shuts steam valves, turns on cooling water valve, opens vent and drain valves.

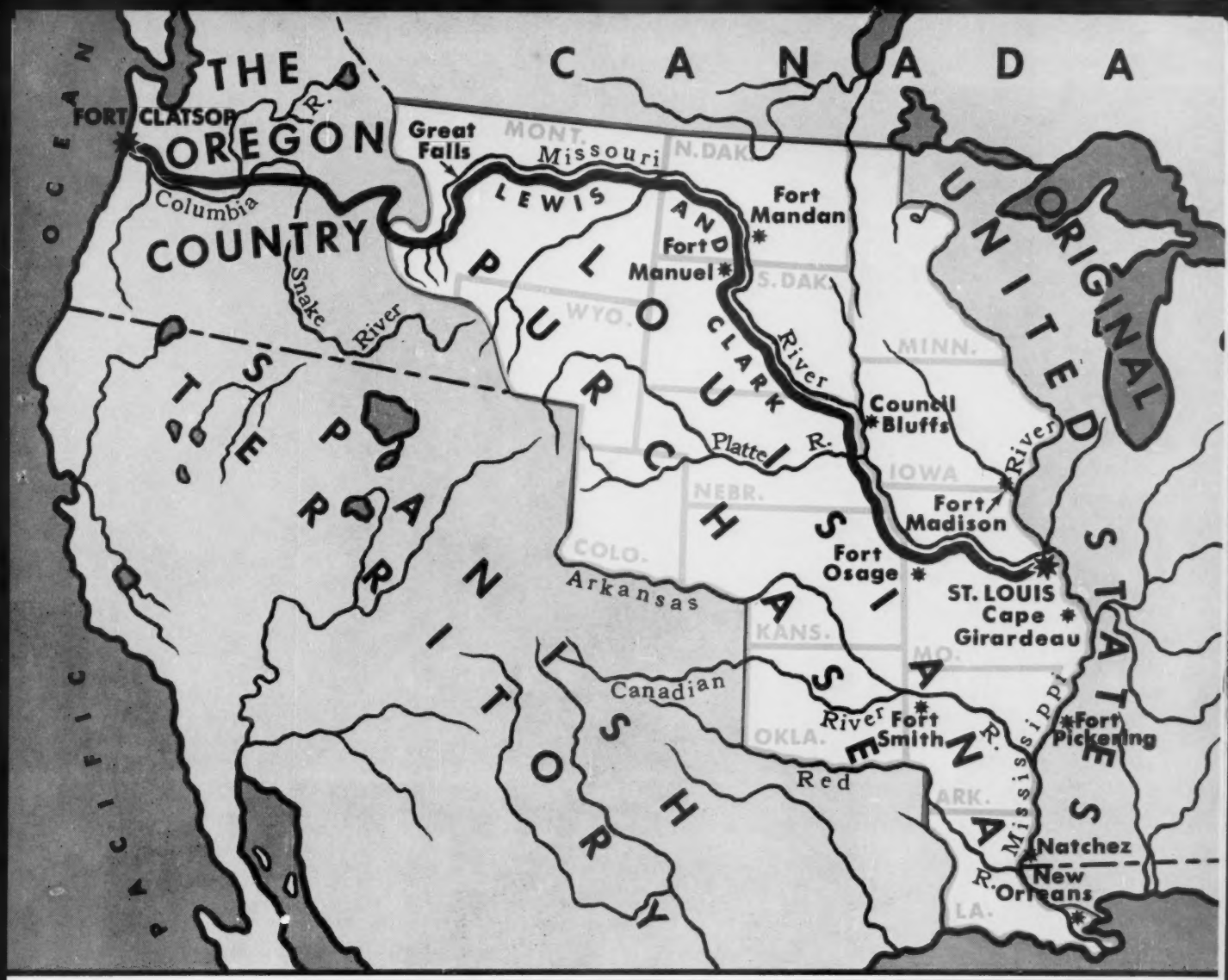
5. At end of cycle, water valve shuts, timer stops. Only when pressure in heater reaches zero can door be opened.

This is another example of how Taylor is solving unusual control problems in the rubber industry as well as providing consistently accurate instrumentation for more conventional processes. Whether your problem is giant or midget, your Taylor Field Engineer will be glad to discuss it with you. Or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Reg. U.S. Pat. Off.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST



1803 · THE LOUISIANA PURCHASE · 1953

"From this day, the United States take their place among the powers of the first rank," said Robert R. Livingston as he signed the Louisiana Purchase treaty in the year 1803. (Livingston and James Monroe had been selected by President Thomas Jefferson to try to buy New Orleans and Florida from the French.)

With the purchase — the 150th anniversary of which is being observed this year — the United States obtained one of the richest storehouses of food stuffs, fuel, and power; the area itself eventually combined six complete states, and parts of eleven others. The price — $15,000,000.

The Lewis-Clark expedition brought knowledge of the vast expanse of land which lay west of the Mississippi River. The Mountain Men, or hunters and trappers, were the next to follow; then the covered wagon and, at long last, the railroad which connected the eastern coast with the western coast.

Look at a modern road map of the United States today; note how completely every section of the land is linked with the whole nation by the world's greatest highway system. If you could look at the highways themselves you would see trucks, buses, passenger cars, transporting man and everything he produces. No section is remote; no region is beyond access.

Everywhere man goes today, the rubber tire makes his journey quicker and easier. From New Orleans, up the Mississippi, up the Missouri, over the Rockies to the Pacific coast, the rubber tire spins man on his way.

Carbon black is one of the great contributions to the wearability, strength and long life of today's tire — for a quarter of a century United Carbon has been a leader in its production.

UNITED CARBON COMPANY, INC.

Kosmos 70, United's most recent oil base black, is a marvel of strength and stamina for wear and flex resistance among the Superior Abrasion Furnace (SAF) type blacks. But even more, Kosmos 70 is a safe processing black readily adaptable to synthetic and natural rubber.

Put your faith in United blacks. They will keep your tires rolling.

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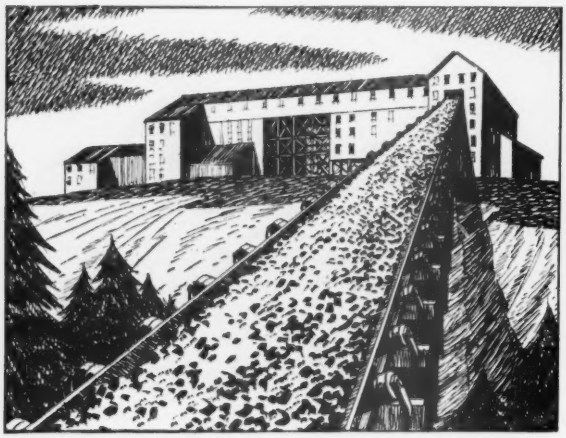
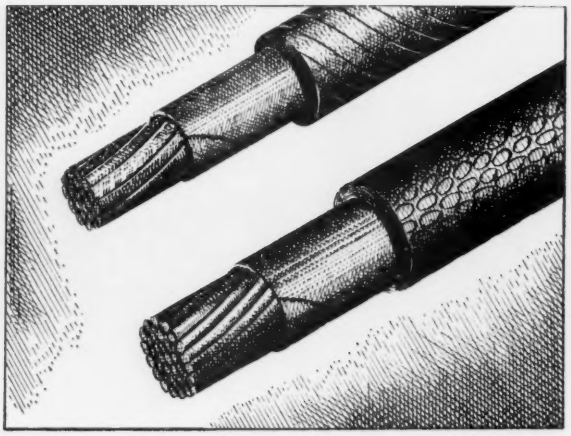


For industrial conveyor and power transmission belts, Wellington Sears has a complete line of fabrics to insure long life and top performance.



"Columbus" sheeting is ideally suited for cable wrapping and other rubberized mechanical goods because of its constantly uniform quality.

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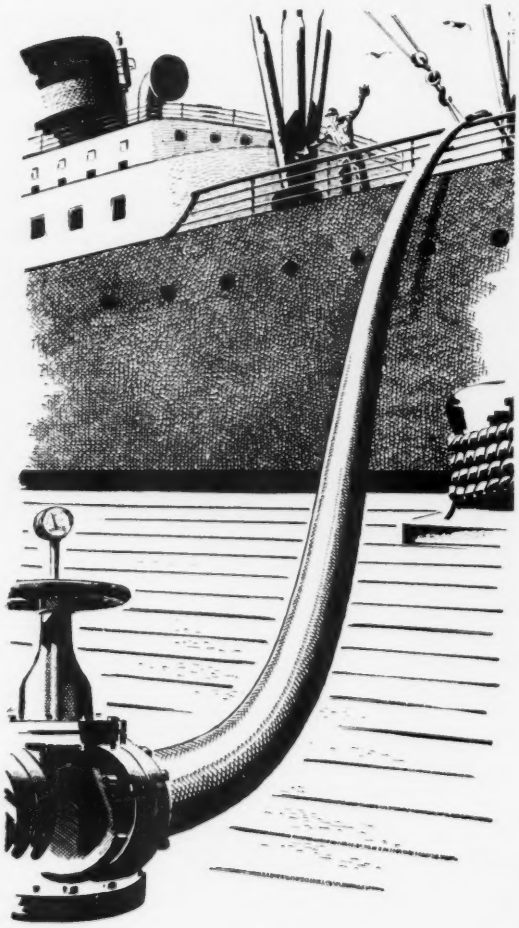
This Wellington Sears duck is a soft, strong, plied-yarn cotton fabric assuring flexibility and good impregnation. You'll find it available in many standard, as well as special, constructions for specific requirements.

With over 100 years' experience in industrial fabrics, Wellington Sears offers a complete line of cotton ducks for hoses of all types, belting and other mechanical rubber products . . . also fabrics utilizing the unique properties of high tenacity rayon, nylon and other fibers for rubberized specialties of many kinds.

If it's a rubber-and-fabric problem — talk it over with Wellington Sears.

Write for your free copy of "Modern Textiles for Industry" which includes pertinent information on rubber applications. Address: Wellington Sears Co., Dept. L-2, 65 Worth St., N. Y. 13.



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Nylon, high tenacity rayon, other synthetics and combinations.

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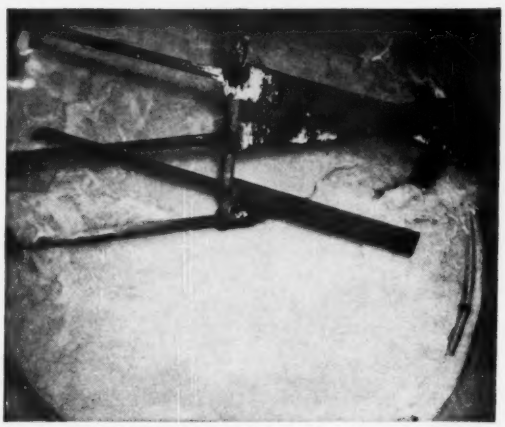
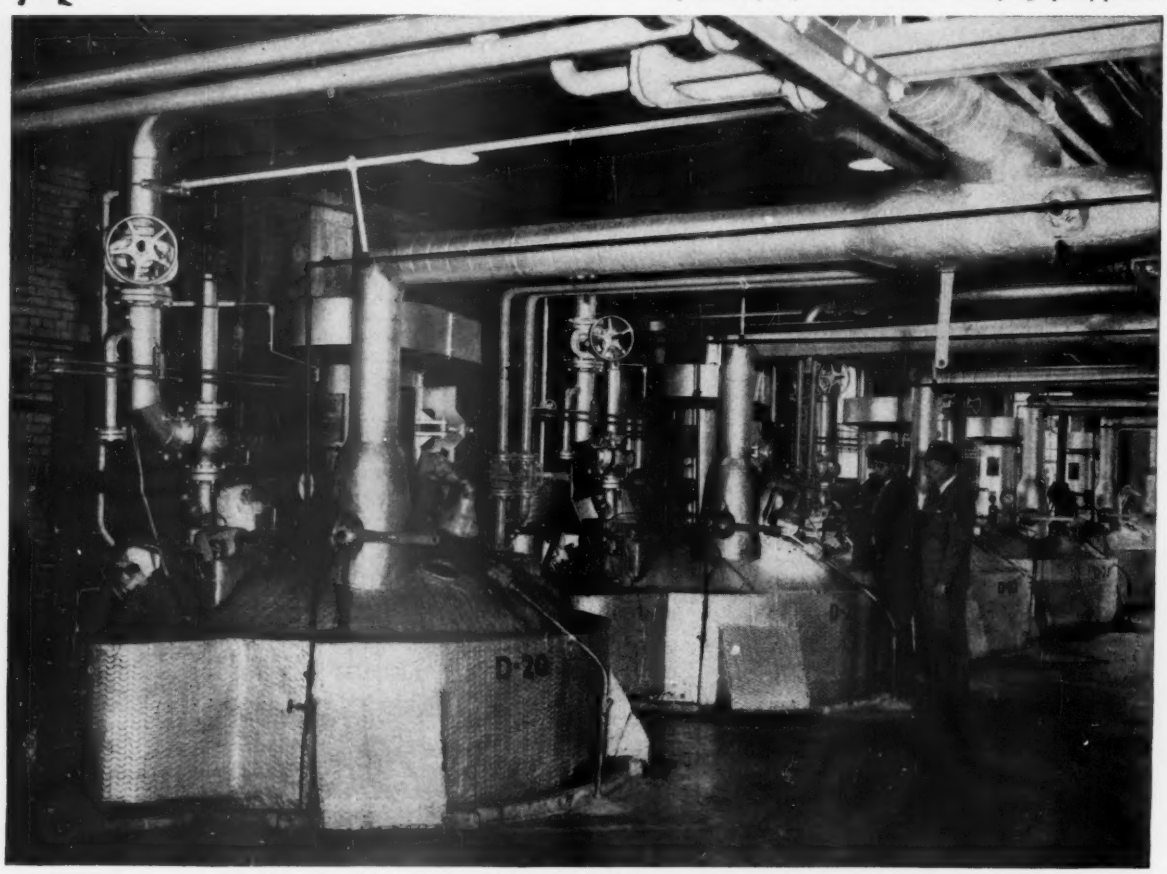
Hercules pioneered in the development of emulsifiers and initiators which were essential to the perfection of various grades of GR-S, particularly cold rubber. Today, these rosin derivatives are widely recognized by the synthetic rubber industry for their contributions to accelerated production cycles and superior product performance.

Hercules emulsifiers include Dresinate® 214 and 731—which offer optimum tensile strengths, elongation, and tear resistance in GR-S formulations. There are three Hercules hydroperoxides —Cumene (CHP), Para-Menthane (PMHP) and Diisopropylbenzene (DIBHP)—all noted for their stability and high polymerization action, especially at low temperatures.

HERCULES POWDER COMPANY
INCORPORATED
918 Market Street, Wilmington 99, Delaware



One step in the production of Dresinate—a digester at the Hercules plant in Hattiesburg, Mississippi. Here, as throughout all processing operations, quality control assures a uniformly high-quality product.



Section of a GR-S plant operated by B. F. Goodrich Chemical Company in Port Neches, Texas, where Hercules emulsifiers and initiators are used in the polymerization process.

IR53-2

You Will Want THIS BOOK

Multiple Opening
This picture is typical of multiple opening platen type presses of strain plate construction. This particular press is intended for curing rubber molded products but similar presses are used for press polishing and many like applications. The strain plates are preferred for some work because they provide greater rigidity than strain rods and prevent radiation and heat loss from steam-heated platens. A variety of accessories are available for spacing the platens, opening them, and connecting them to the steam supply. Various elevator arrangements can also be supplied for rapid loading and unloading.
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PLATEN PRESSES
A 2200-ton eight-opening molding press with heated platens 60" square. The method of connecting the platens to the steam and exhaust manifolds is one of a number of designs that are available.
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"Stream-Flo" insulating head that assures the most efficient operating velocities.

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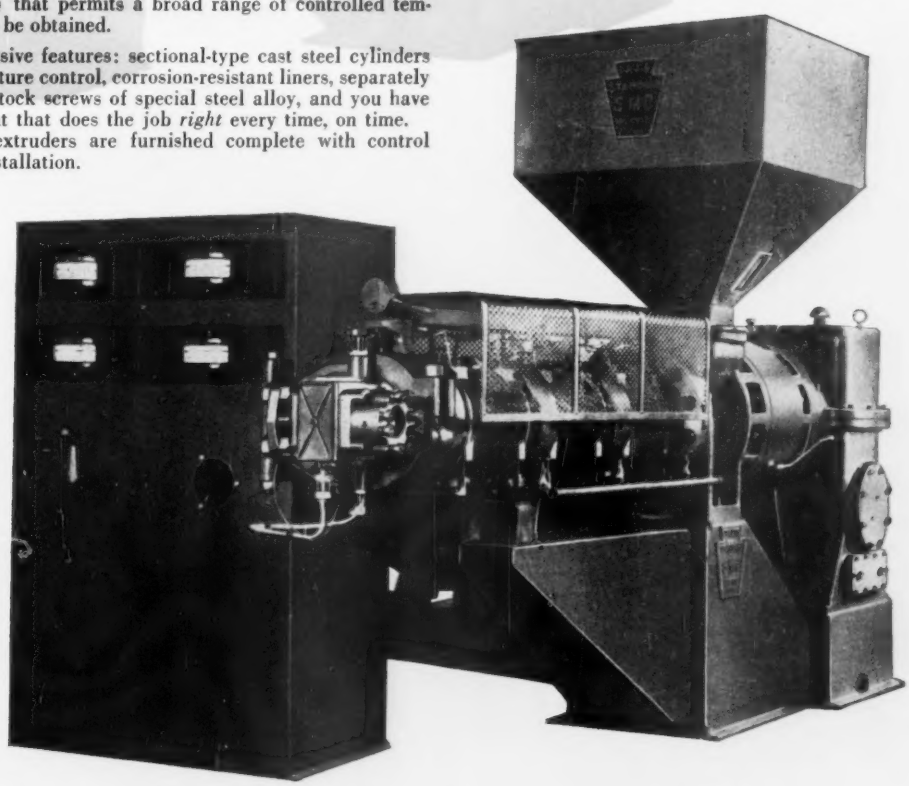

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National Erie products for the Plastic and Rubber Industries • Extruders • Simplex Doors for Autoclaves • Mills and Hydraulic Presses.

This old and well-known line of machinery was acquired March 1, 1952, by The Aetna-Standard Engineering Company. They are manufactured in their Warren, Ohio, and Ellwood City, Pa., plants. The sales and engineering of the National Erie line is the responsibility of Hale and Kullgren, Inc., Akron, O.

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how long did it take to get from here ...to here?

Answer: 13 years

The first practical rubber tire specifically designed for farm tractors was developed in 1932. By 1945, thirteen years later, two other important developments had been announced: (1) the world's heaviest and (2) the world's largest rubber tires had been produced—both for special tractor-type equipment.

Monsanto has served the rubber industry for many years, with such chemicals as Thiuram accelerators: Thiurad, Ethyl Thiurad, and Mono Thiurad. These three accelerators are offered in powder and pellet form. Write for a copy of Monsanto's rubber chemicals catalog, which includes complete specifications for the Thiurads. MONSANTO CHEMICAL COMPANY, Rubber Service Department, 920 Brown Street, Akron 11, Ohio.

THE HISTORY OF THE RUBBER INDUSTRY—Number 5

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What features do you look for in your solvents? If they're low end points, controlled evaporation, low vapor pressure, a minimum of unsaturates and pyrogenic decomposition products—you get them *all* with Skellysolve!

And Skellysolve's minimum of low and high boiling compounds helps reduce rejects due to blushing and blisters. Controlled vapor pressure reduces danger of bloated containers . . . and minimum of low boiling compounds eliminates "seeds" from rubber cements. Freedom from greasy residues assures rubber cements of high bonding strength.

Write now for more complete technical facts. And if you require special help on solvent applications, you are invited to consult with the Skellysolve Technical Fieldman.

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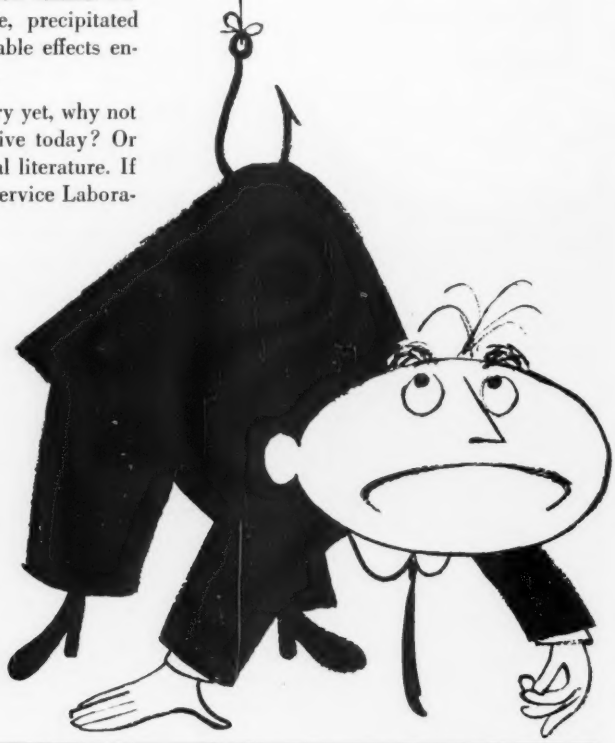

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CABOT

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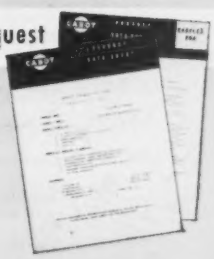

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It's appearance—not mileage—that sells floor tile!

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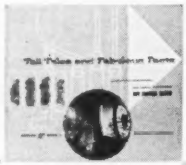

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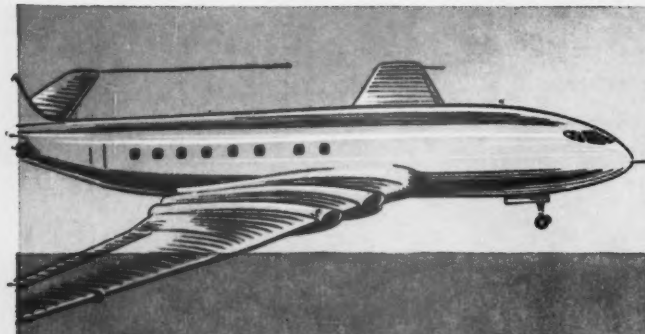

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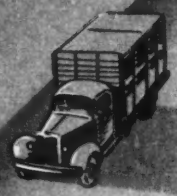

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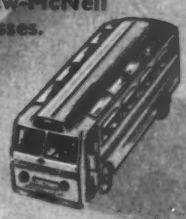

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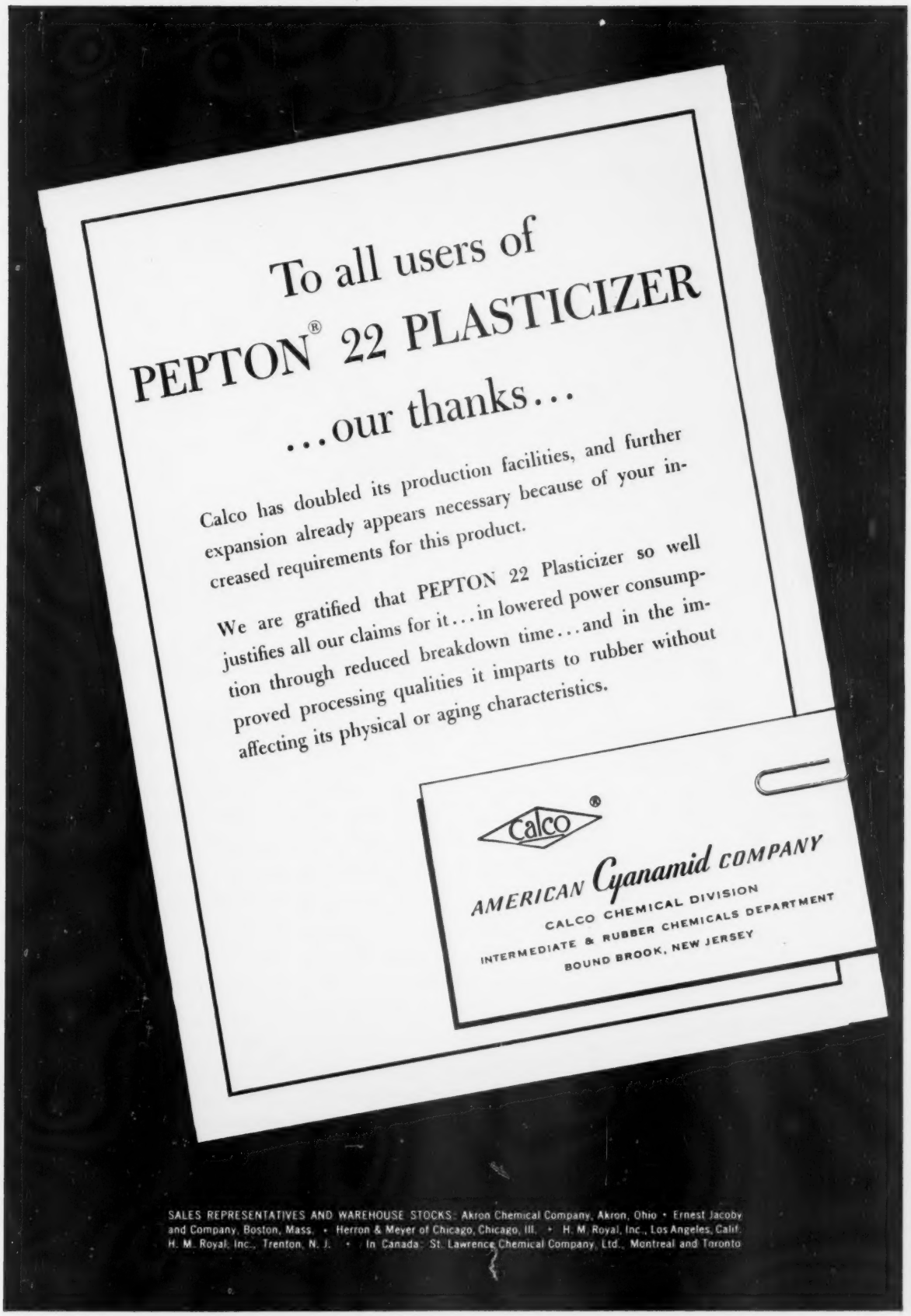
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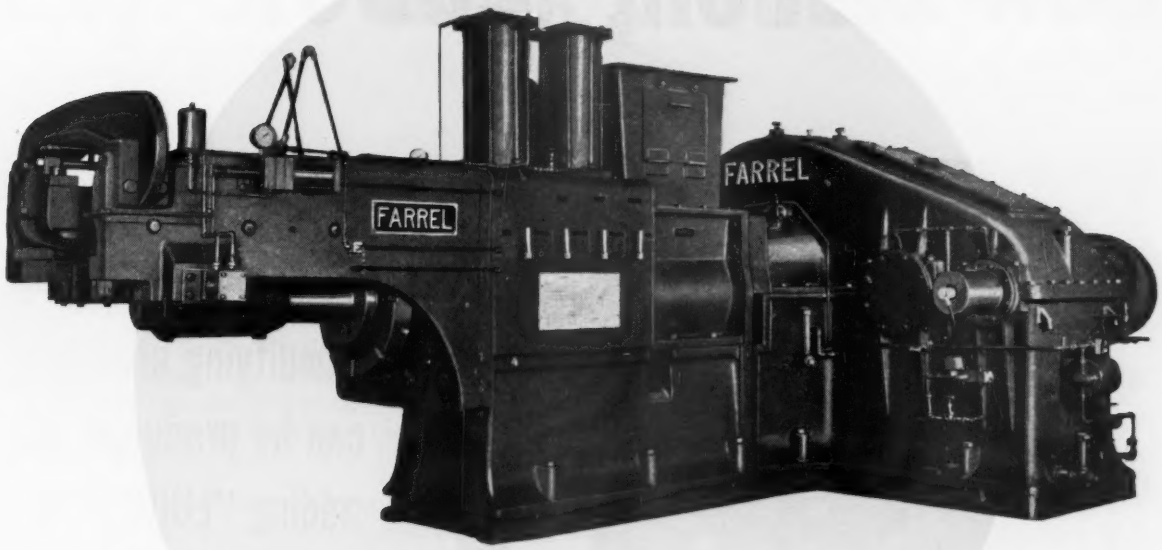

This NEW Giant Extruder can take the output of two size 11 Banbury* Mixers

This new extruder can be used with one size 11 Banbury mixer on short-cycle operation of 1½ to 2½ minutes, or with two size 11's for longer cycles. The extruder is installed under the Banbury, and in the case of two mixers, a belt conveyor carries the discharge from the second mixer to the extruder hopper, alternating with the gravity feed from the first mixer. With this arrangement, production can be maintained at a rate of 10,000 to 18,000 pounds per hour. Operation is entirely automatic.

An electric eye in the feed hopper actuates an air-operated clutch in the drive to stop the machine when the hopper becomes empty between batches. This keeps the screw always full of stock, so that the slab discharged is uniform and unbroken.

Extruders of this size provide the answer to full utilization of short-cycle operation of large-capacity Banbury mixers. The bottleneck of a group of milling operations following Banbury processing is eliminated, together with all manual handling connected with milling. Flow of material is accelerated and simplified; also the plasticity of stock worked by the screw in a single pass in the extruder chamber is more uniform than that of milled stock.

Where the desired rate of production warrants an installation of this size, Farrel-Birmingham's long experience in the design and manufacture of extruding machines takes the risk out of the investment. Write for complete details.

These machines extrude through a circular die. The stock is slit at the die exit to form a continuous slab, approximately 50 inches in width, which can be cut to desired lengths.

A retractable cone, operated by an air-hydraulic system, facilitates rapid automatic cleanout (see above photo). A hydraulically operated locking device keeps the cone in positive operating position. Gauging blocks of different thicknesses, which are mounted on the carriage, are used to adjust the die opening.

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ANSONIA, CONNECTICUT
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FB-847

Farrel-Birmingham®

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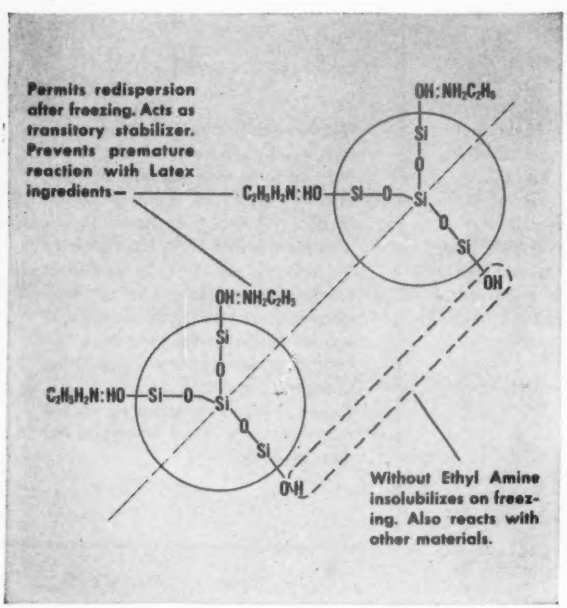
How Du Pont "LUDOX" can

What "LUDOX" is

"Ludox" is a 30% colloidal solution of almost pure amorphous silica particles (SiO_2) in the form of polymerized silicic acid. The electron photomicrograph—magnification 175,000 times—shows the fineness and uniformity of "Ludox" particles. The average particle's size of 17 millimicrons is below the range of the best carbon blacks.



Any of these valuable modifying effects can be produced by adding "LUDOX" to latex formulations

- Improved Adhesion
- Increased Stiffness
- Increased Water Resistance
- Increased Abrasion Resistance
- Decreased Dry Tack

How "LUDOX" works

The diagram at left shows surface hydroxyl groups on "Ludox" particles. These groups make the particles chemically reactive in contrast to commonly used dry fillers. This reactivity has led to many unusual properties and uses for "Ludox" in the latex field. The diagram also shows a typical "Ludox" reaction—with and without monoethylamine. The reaction with ethyl amine is useful in the stabilization of some latices containing "Ludox."

improve latex products

Your chemists can create new combinations of properties in latex-dipped goods, coatings, adhesives . . . whatever products you make—using Du Pont "Ludox"* colloidal silica. And new properties can mean new sales advantages—new markets for your products.

Here are some examples of how "Ludox" has improved latex products:

Neoprene thread was produced with a nearly doubled modulus over the entire range of elongation. Seven parts of "Ludox" were added per 100 parts neoprene latex. Modulus can be increased, too, in natural rubber films.

In neoprene-coated belting, adhesion was improved and flaking stopped by adding "Ludox." In a paper saturant, abrasion resistance was increased 20 to 40%!

A natural-rubber adhesive was doubled in strength of leather-to-leather adhesion when 20 parts of "Ludox" solids were added per 100 parts natural rubber latex solids. Such outstanding improvements have also led to the use of "Ludox" in GRS and neoprene latex adhesives and coatings.

An uncured Buna N solvent coating on cloth had no surface tack whatsoever when treated with "Ludox." In decreasing or eliminating tackiness, "Ludox" can be applied as an aftercoat or, in the case of latex, incorporated in the compound.

Neoprene films have shown exceptional increases in water resistance and decreases in water swelling upon addition of 20 parts "Ludox" solids per 100 parts neoprene latex solids.

Neoprene foam required about 20% less solids to attain a given modulus when 5 parts of "Ludox" solids were added per 100 parts dry neoprene. This saving of raw material was obtained without affecting flex life, bend flex, or compression set.

In these and other cases "Ludox" has provided combinations of properties difficult to achieve by any other means.

What's more, a little "Ludox" goes a long way.

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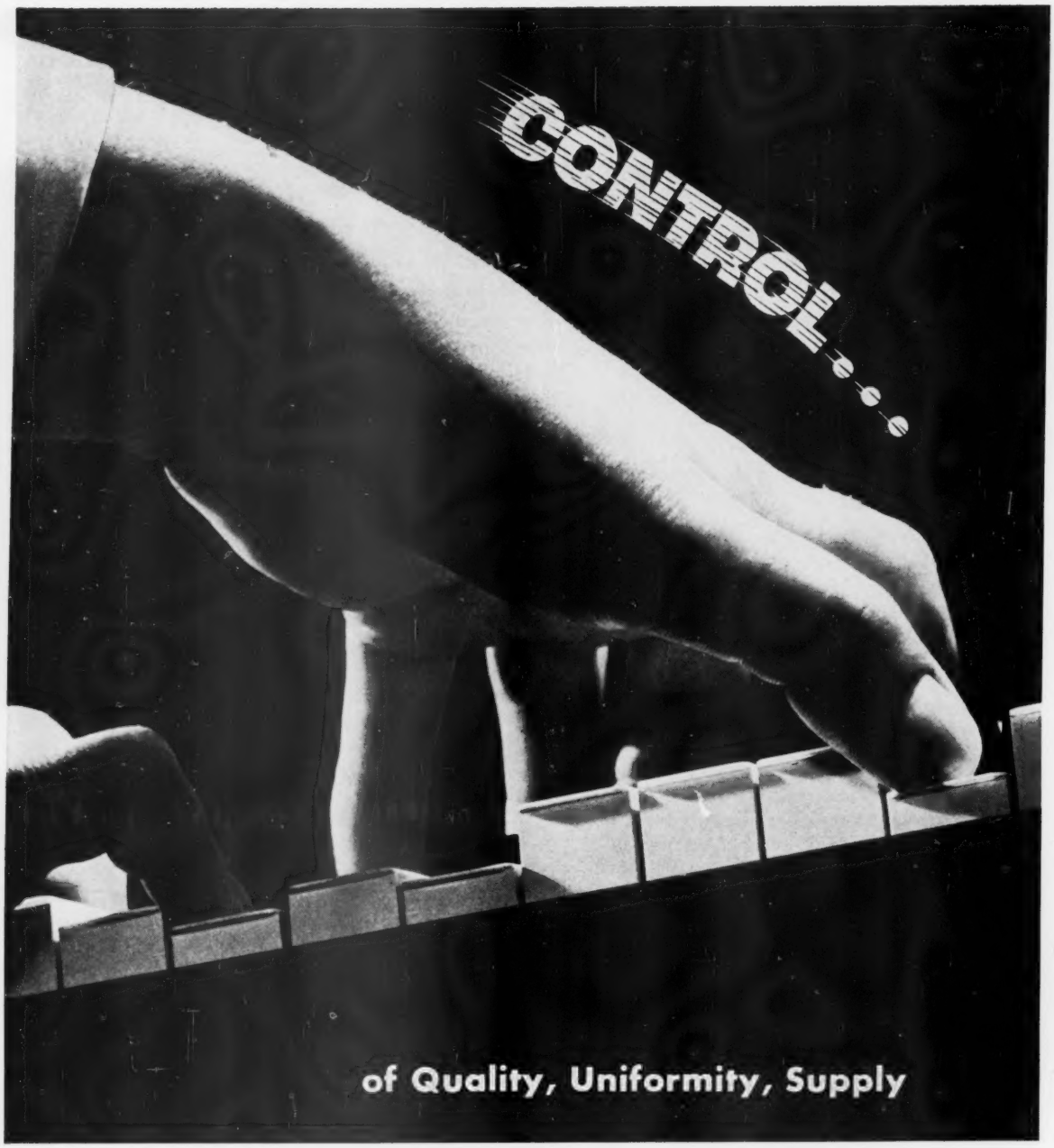

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CUMAR* Paracoumarone-Indene Resin
BRC* 20 Hydrocarbon
"BRC" 30 Hydrocarbon
BRV* Rubber Softener
BRT* 3 Rubber Reclaiming Tar
"BRT" 4 Rubber Reclaiming Tar
Resin "C" Resinous Compounding Material
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ELASTEX* 28-P Plasticizer (DOP)
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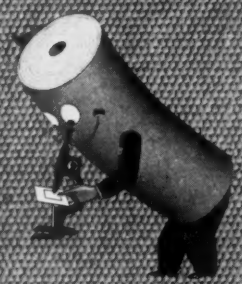

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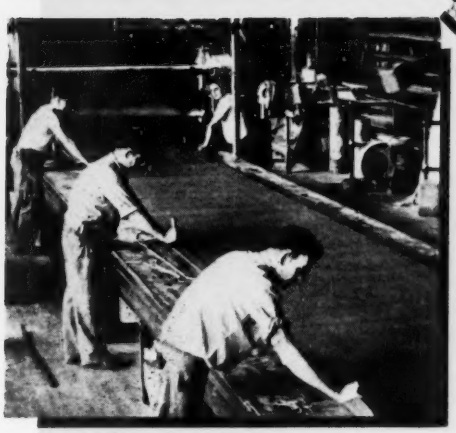

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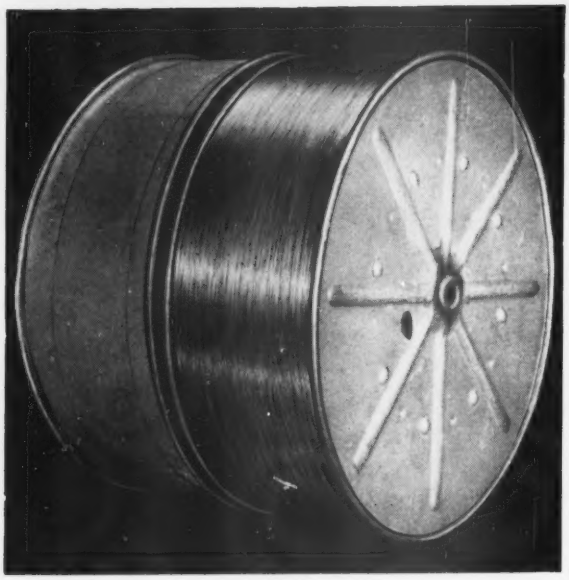

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FARREL-BIRMINGHAM
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Equipment News

PUBLISHED BY FARREL-BIRMINGHAM COMPANY, INC. — ANSONIA, CONNECTICUT

WHY FARREL-BIRMINGHAM PRODUCES SUPERIOR BANBURY* MIXER REPAIRS AND REBUILDING

Farrel-Birmingham does a better job of rebuilding a Banbury mixer than any repair shop could possibly do because, as the sole manufacturer of this machine for thirty-six years, the company has unequalled experience, facilities and know-how to return a worn Banbury mixer to its original work capacity. Furthermore a Banbury mixer rebuilt by Farrel-Birmingham benefits from a product-improvement research program that has been continually carried on during the entire period that this company has manufactured over 2,000 of these machines.

Especially in recent years, close study of performance records, persistent engineering effort and advancements in metallurgy have resulted in a number of important improvements to the Banbury mixer. Modern features of design and improved materials which provide higher operating efficiency and greater wearing qualities can now be incorporated into a machine being rebuilt, the same as in a new Banbury.

COMPLETE DRAWINGS

Farrel-Birmingham is the only company having complete drawings showing the original dimensions of every part of the Banbury mixer. This is essential information for correct and precise work in both rebuilding and making repairs to these machines.

When a part—such as a rotor, a door top, or the inside of the chamber body, for example—is worn, blueprints show the Farrel-Birmingham engineer just how much rebuilding is required to return the part to its original size, contour and work efficiency. There is no guessing.

When any one of the 775 parts, which make up a Banbury mixer, needs replacement, a company engineer can look at a drawing and specify the right part in a matter of minutes.

NECESSARY FACILITIES

Farrel-Birmingham is the only company having complete jigs, fixtures and gauges necessary for satisfactory repairs. 242 of the pieces of a new Banbury have to be machined, calling for a total of 882 operations to finish. The use of our special equipment and facilities in rebuilding work assures both accuracy and quick service.

A NEW-MACHINE GUARANTEE

Banbury mixers rebuilt by Farrel-Birmingham carry exactly the same

(Continued on next page)

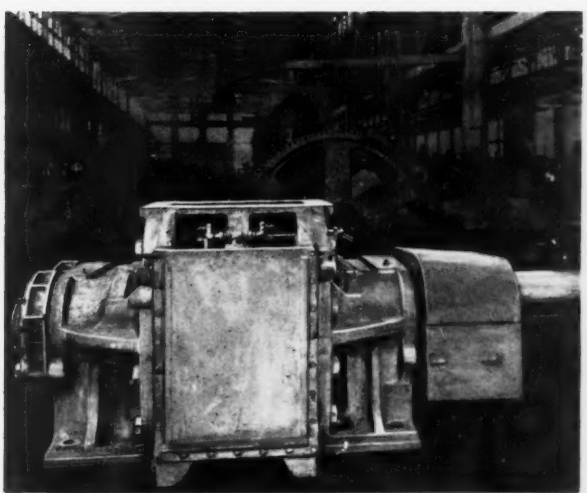

Fig. 1—Worn Banbury mixer body returned to Farrel-Birmingham for repairs.

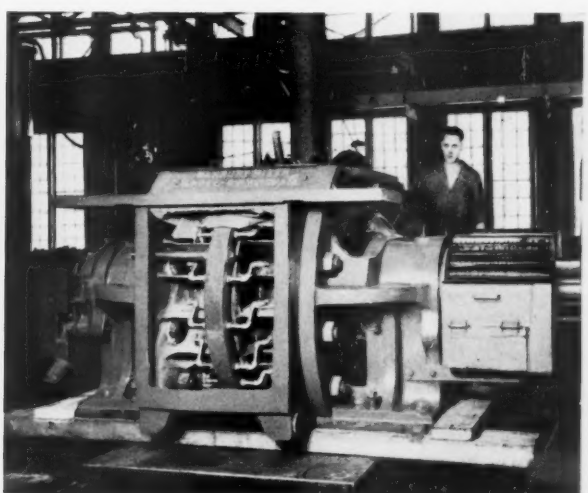

Fig. 2—Complete rebuilt body, reassembled and tested, guaranteed the same as a new machine.

* Trade Mark

FB-866

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Fig. 3—Candid shot of a worn rotor. Looks in bad condition, but it's not hopeless.

Fig. 4—Now the entire rotor—necks as well as body—has been built up to full original size.

guarantee as new machines. Such a guarantee by the original manufacturer provides assurance that the rebuilt machine will be "as good as new" when it is returned to service.

COSTS

The high quality of the Banbury repair work done by Farrel-Birmingham cannot be matched at lower prices—or at any price, for that matter. New parts are priced fairly; suitable allowances are made for old parts taken in trade.

PICTURES SHOW THOROUGHNESS

The accompanying illustrations (see figures 1 to 10) give an idea of the thoroughness of a Banbury rebuilding job at the Farrel-Birmingham Derby plant.

As soon as a worn Banbury, such as the one shown in figure 1, is received, the heavy grease and accumulation of rubber around the dust stops are removed by burning and scraping. After this, the body is dismantled and the parts are further cleaned by immersion in a degreasing tank. All parts are then inspected, magnafluxed for hidden cracks, and their condition recorded, with instructions for repair of all usable parts and replacement of those that cannot be salvaged.

ROTORS

Figures 4, 5 and 6 show how a worn rotor, such as the one illustrated in figure 3, is rebuilt. After the entire rotor —thread ends, journals, dust stop sections and gear fits, as well as the body itself—has been built up to full original size, it is then machined and ground to the proper dimensions. Figure 4 shows the built-up rotor before machining. In figure 5 the necks have been rough-machined and the body rough ground. Figure 6 shows the finished rotor, rebuilt to its exact, original dimensions.

It is in work like this that it counts so much to have the skill, the knowl-

Fig. 7—Hundreds of rotors for all sizes of Banbury mixers are in stock at the company's Derby plant.

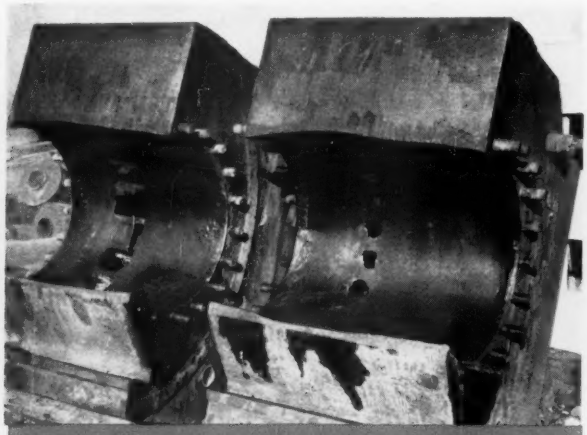

Fig. 8—These sides are badly worn, but can be repaired by inserting new liners, as shown in figures 9 and 10.

Fig. 5—Here the necks have been rough-machined and the body is being gauged after being rough-ground.

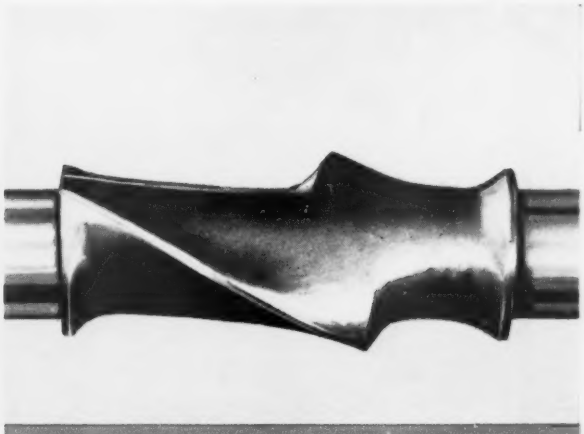

Fig. 6—Rebuilt rotor, completely restored to its original dimensions, ready for plenty of hard work.

edge, the original drawings and the special facilities found only where new Banbury mixers are manufactured.

SIDES

Sides as badly worn as those in figure 8 can still be salvaged by boring and then welding in new liners. Figure 9 shows a bored side ready for the insertion of the new liner, and in figure 10 the new liner is being gauged after having been ground to exact size.

When the damage is not so great, the bore of the liner is built up with hard-surfacing metal, and then machined and ground to accurate dimensions. In either case, the rebuilt side, when completed, is as good as new.

OTHER PARTS

These operations on two of the larger parts are just examples of how thoroughly a Banbury mixer body is rebuilt at Farrel-Birmingham. End frames, door top and cylinder, dust stops, thrust collars, connecting gears and all other parts also receive careful examination and are either restored to "good-as-new" condition, or, if necessary, replaced.

Figure 2 shows a complete rebuilt body, reassembled, tested and ready to leave the shop, carrying a new-machine guarantee.

FREE INSPECTION SERVICE

A complete and competent inspection service, by factory-trained mechanics, is available to all users of Banbury mixers in the United States. A request will bring an inspector to your plant, promptly and without cost to you. He will examine your machines thoroughly, report to you on their condition, and recommend exactly what needs to be done to put them into first-class shape.

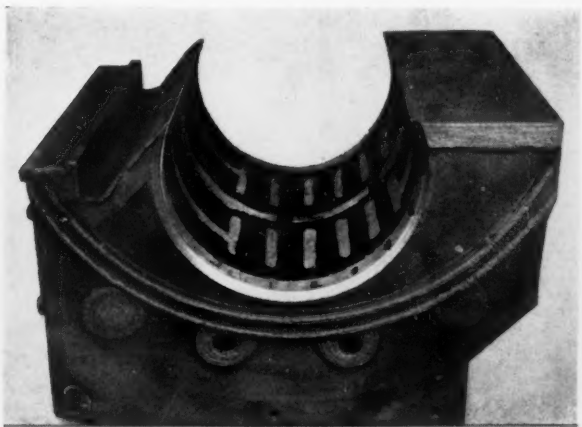

Fig. 9—This side has been bored, ready for a special-alloy, one-piece liner to be welded in.

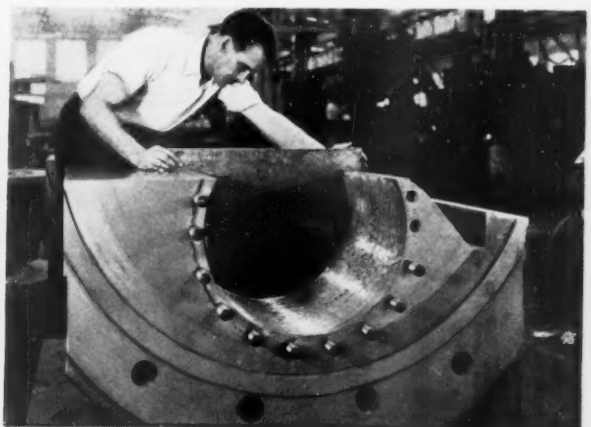

Fig. 10—New liner is receiving a final gauging after having been ground to exact size.

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Farrel-Birmingham Equipment News

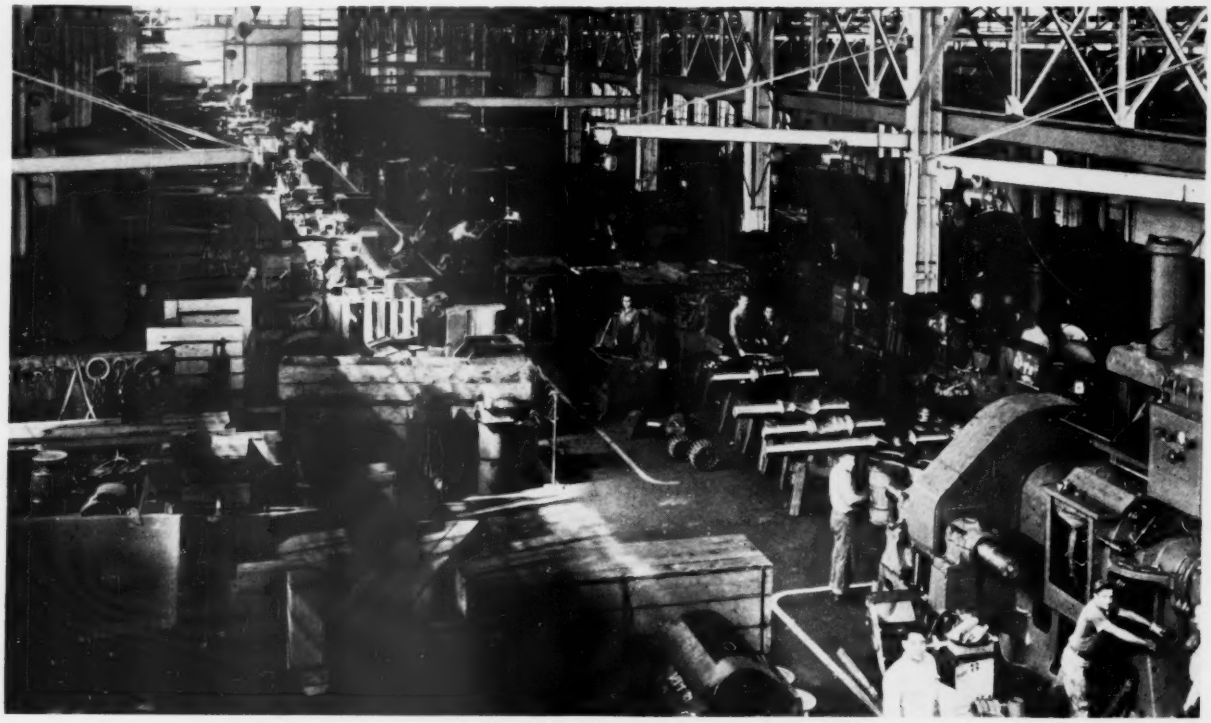
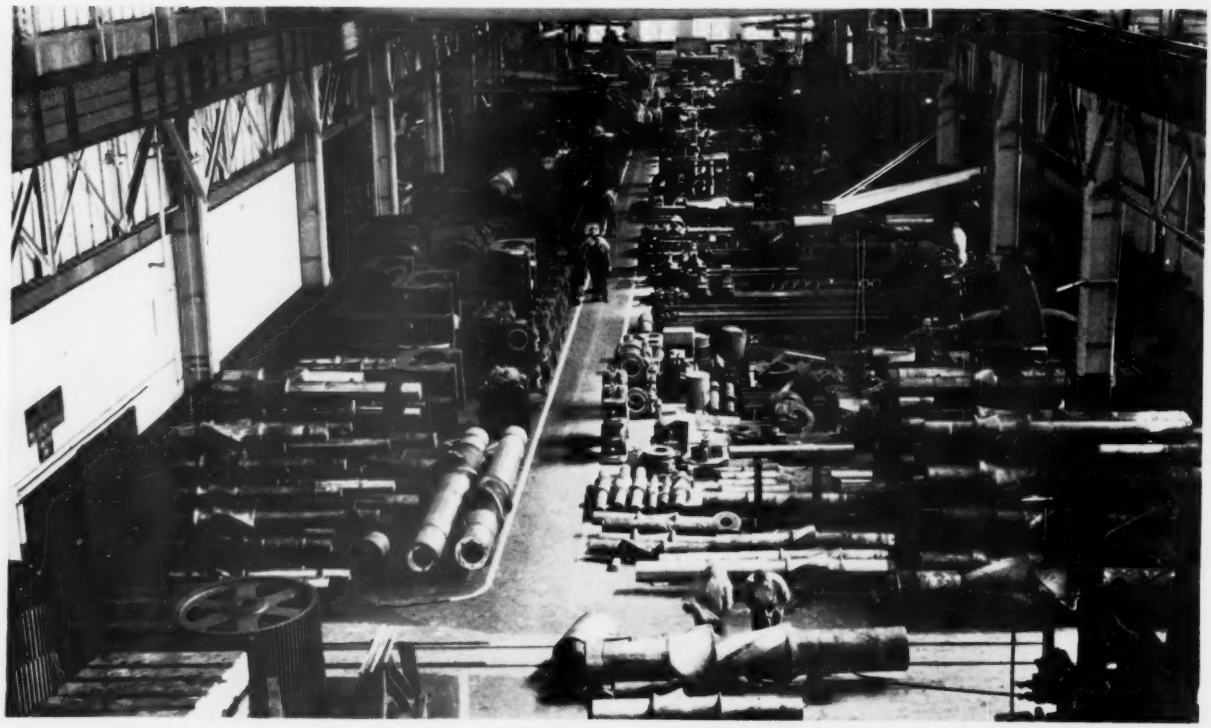


Fig. 11 (above)—Erecting floor in Farrel-Birmingham plant where Banbury mixers, new and rebuilt, are assembled.

Fig. 12 (below)—Some of the million-dollar stock of Banbury mixer parts in the Farrel-Birmingham plant.



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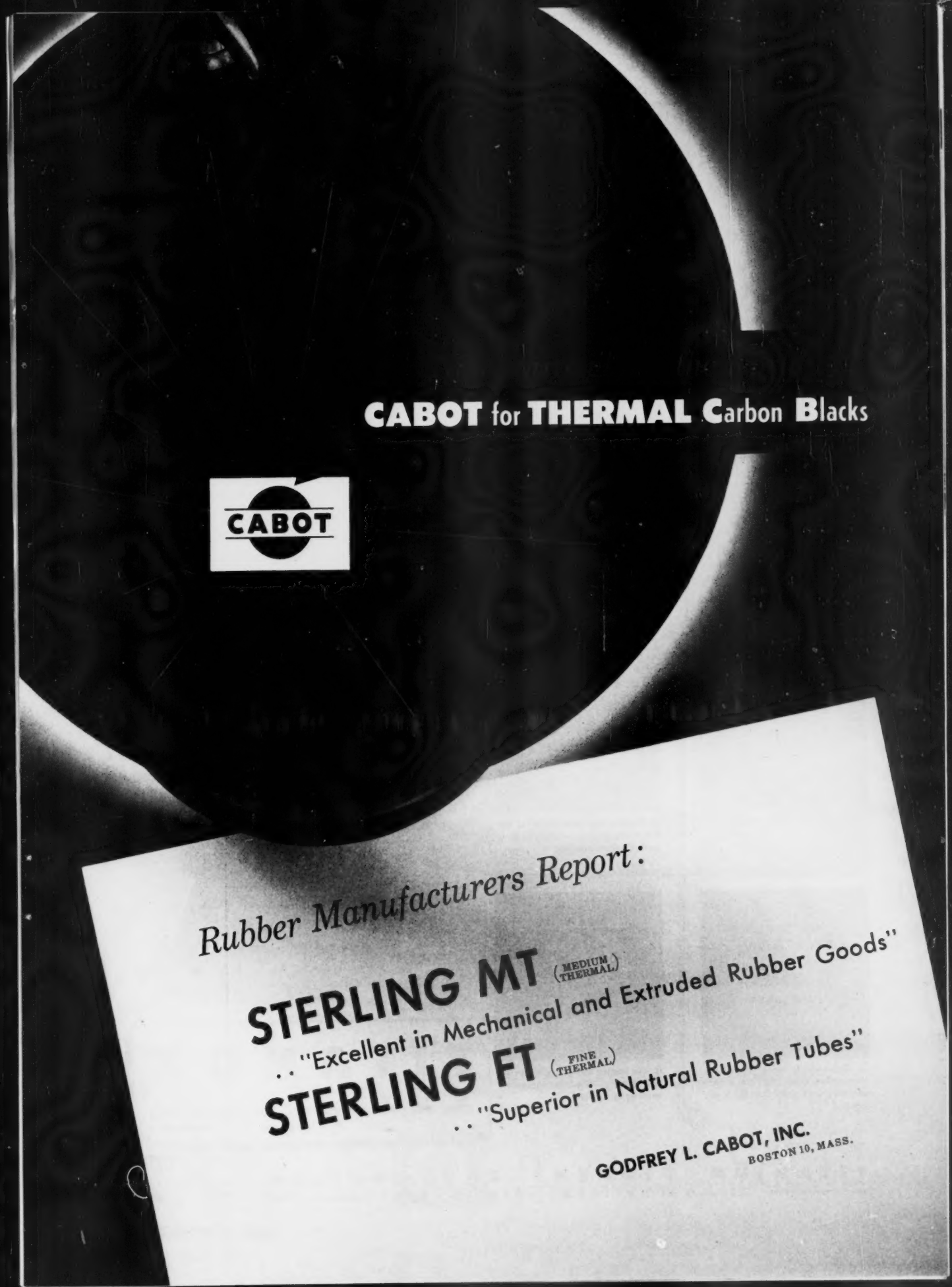
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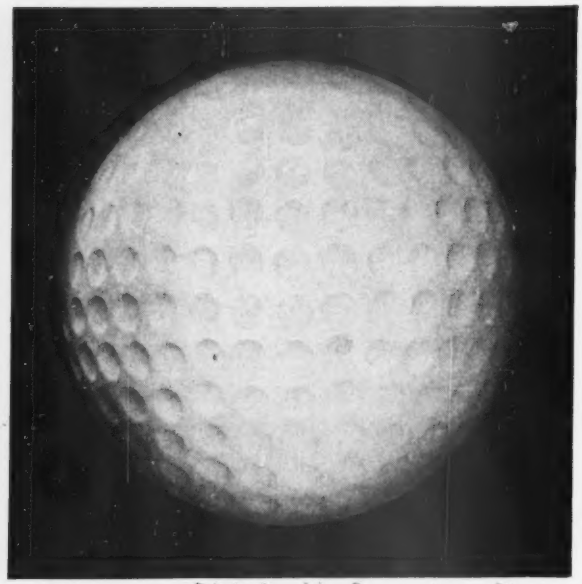

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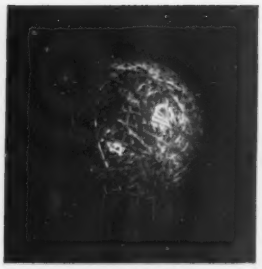

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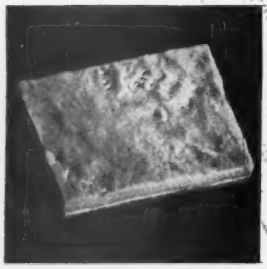

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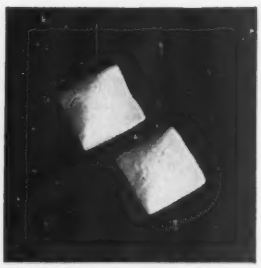

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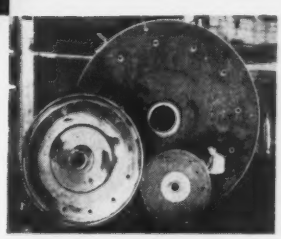

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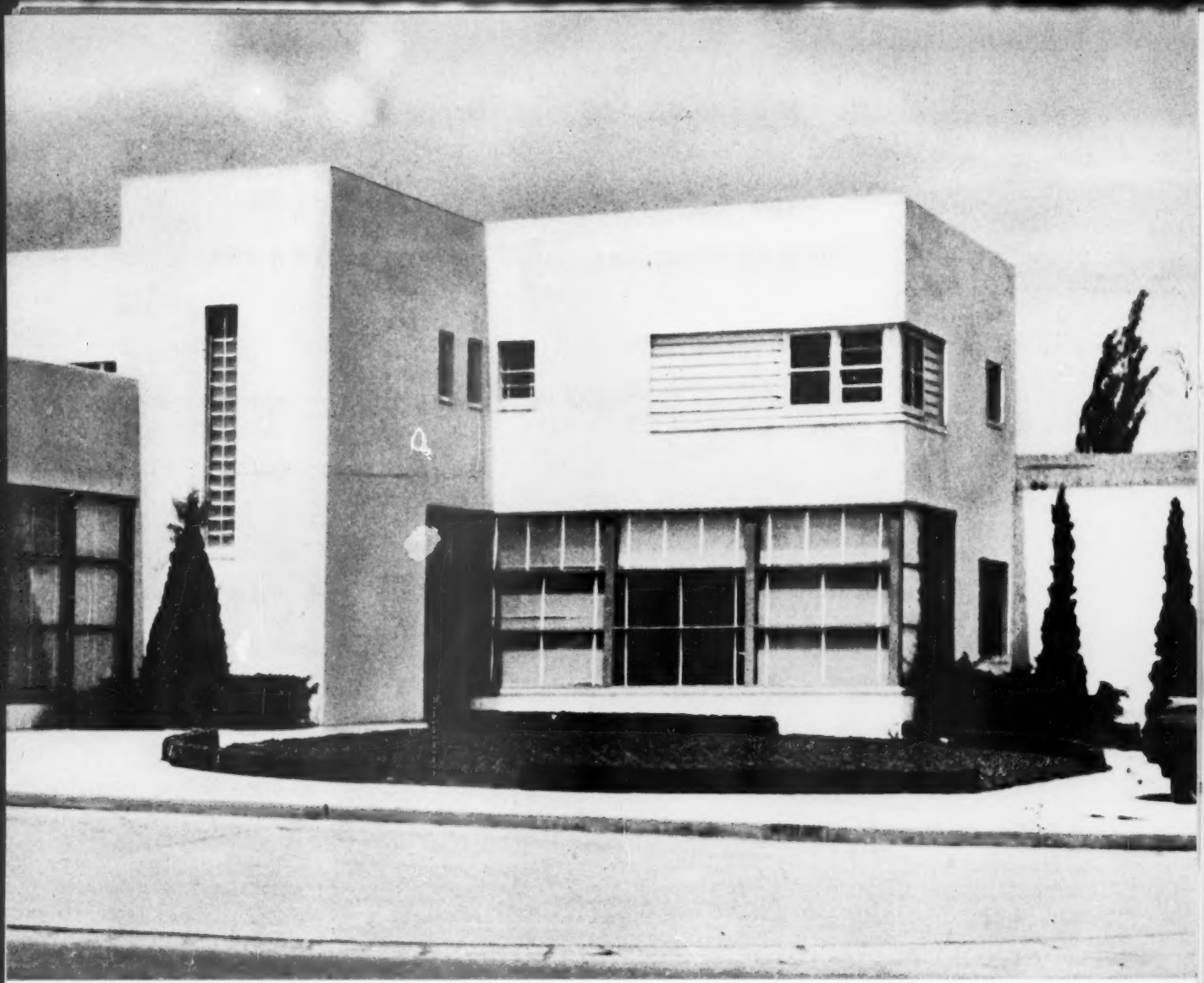

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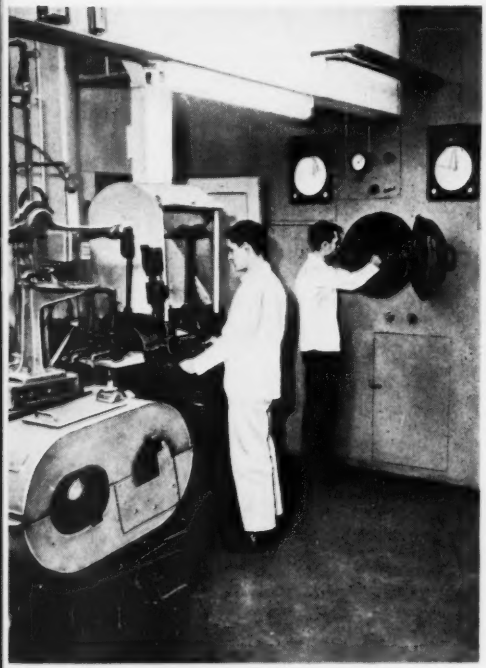
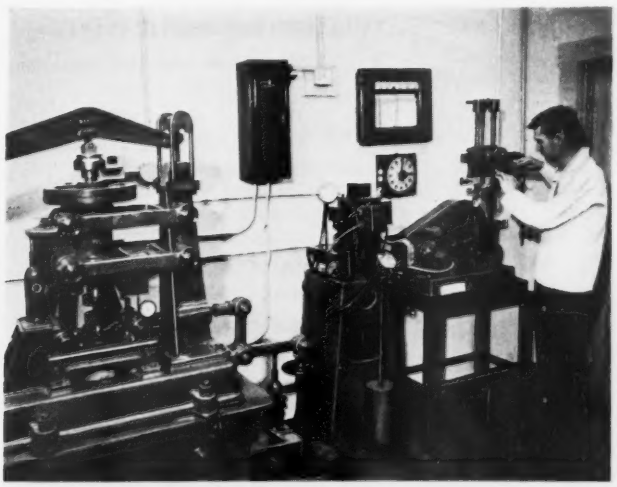


Section of laboratory mill room, showing rubber mills and open steam vulcanizer.



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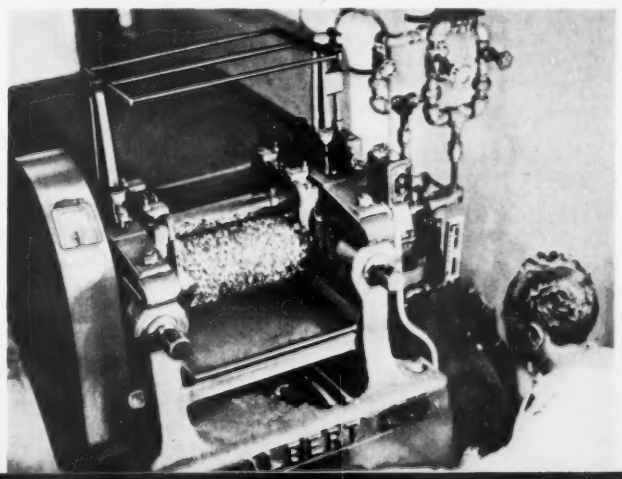

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Published on the 15th of each month by

PALMERTON PUBLISHING COMPANY, INC.

Printing Office,
East Stroudsburg, Pa.

Editorial and Advertising Offices,
250 West 57th St., New York 19, N. Y.

New England Representative—F. ROYAL CAREY, P.O. Box 133, Providence, R.I.

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Entered as Second Class Matter, October 20, 1933, at the Post Office at East Stroudsburg, Pa., under Act of March 3, 1879. Subscription Rates: Domestic, $5.00 a year; Canada, $5.50; Foreign, $6.00. Single copies up to 3 months old, 50 cents; over 3 months old, 75 cents. Telephones: COlumbus 5-2923, 5-2924.

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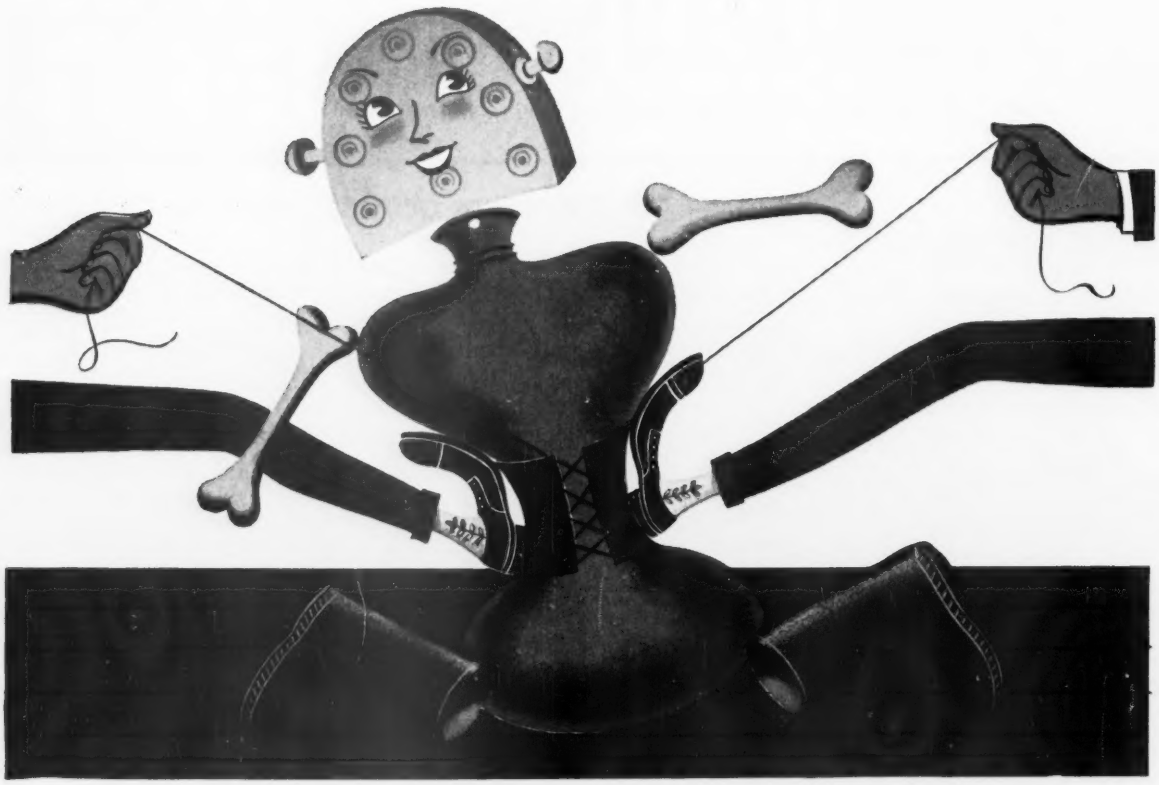

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RUBBER AGE

Vol. 74, No. 1 OCTOBER, 1953

The Reinforcement of Butyl with Carbon Black

Part I—Heat Treatment: Methods and Effects

By A. M. GESSLER

Esso Laboratories, Chemical Division, Standard Oil Development Co., Elizabeth, N. J.

THE purpose of this paper is to describe a method for obtaining greatly improved Butyl rubber vulcanizates with more resilience than any produced previously. The method is based on the thermal treatment of polymer-carbon black masterbatches and is applicable, therefore, to reinforced systems only. Heat treatment affords the means for obtaining greatly enhanced reinforcement in Butyl vulcanizates, and the resulting improvements in physical properties have an important bearing on its applications. The latter include inner tubes, tire casings, and mechanical goods. Several forms of heat treatment are possible and some of these are discussed.

A second purpose of this paper is to show how the vulcanizates are altered by heat treatment. Butyl rubber, because of the unusual chemical stability which results from its low unsaturation, is particularly well suited for this type of work. Thermal treatment may be used over a wide range of conditions without fear of serious polymer degradation. In the absence of undesirable oxidative effects, the course of heat treatment is rather clearly defined and the resultant vulcanizate changes can be interpreted solely in the light of pigment-polymer relationships. This favorable position presents excellent opportunity for a qualitative consideration of the mechanism of reinforcement and its relation to vulcanization and heat treatment. Because very high temperatures can be used, it is also possible to develop short-time, practical methods of heat treatment which appear applicable to industrial scale operation.

Compound

Unless otherwise stated, all compounds were prepared according to the formulation in Table I. Masterbatch was obtained from conventional mixing techniques. Stearic acid was included as a lubricant. Vulcanizing agents, in proportions shown in the table, were added to 301.0 gms. of masterbatch, with or without heat treatment, in 5 minutes on a standard 6x12-inch mill (initial temperature 80°-90°F.; 0.040-0.045-inch roll clearance).

Cyclic Heat Treatment (Alternative Heating and Milling)

In the present work, cyclic heat treatment was carried out as follows: The masterbatch was first heated for ½

TABLE I—FORMULATION FOR HEAT TREATMENT STUDIES

Masterbatch	
Butyl Rubber (GR-I-17)	100.0
Carbon Black	50.0
Stearic Acid	0.5
Vulcanizing Agents	
Zinc Oxide	5.0
Tetramethylthiuram Disulfide	1.0
2,2'-Benzothiazyl Disulfide	1.0
Sulfur	2.0

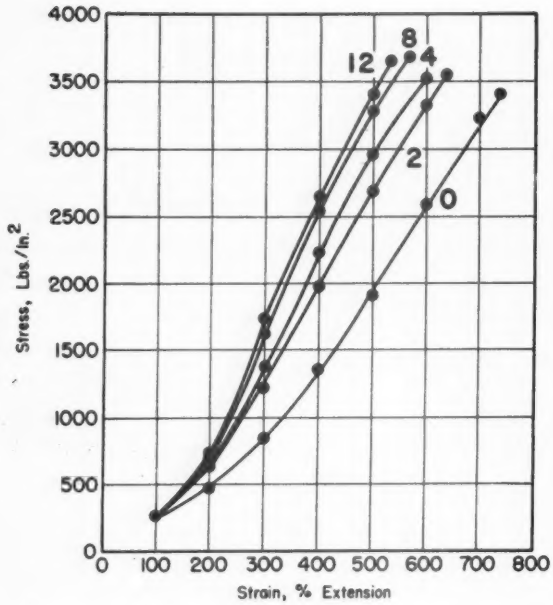

FIG. 1—Effect of cyclic heat treatment on stress-strain properties of Butyl. (The numbers refer to the number of cyclic heat treatments).

hour in open steam at 320°F. and then milled for 5 minutes. The process was repeated consecutively for the desired number of cycles. No advantages accrued from cooling the stock before the milling step. Vulcanizing agents were added during the mastication period following the last heat.

Effect on Stress-Strain Properties: Figure 1 shows the effect of cyclic heat treatment on the stress-strain properties of a Butyl vulcanizate containing MPC black. The compounds were cured for 20 minutes at 307°F. Except at low extensions, modulus increases sharply as a result of this type of heat treatment. Though the increases are greatest in the early stages of the process, it is noteworthy that they persist to the limit of the experiment. Tensile strength is enhanced as much as 10 per cent. The extensibility of the vulcanizates diminishes in parallel with the modulus changes.

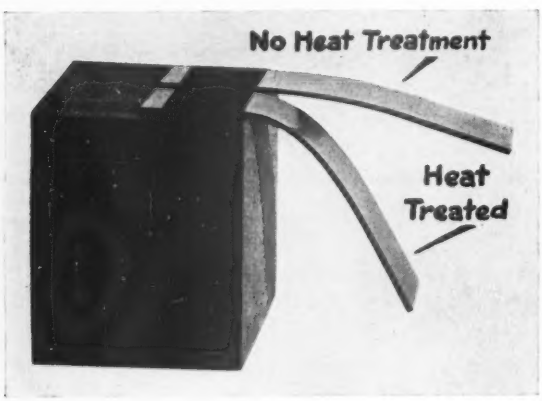

FIG. 2—Effect of heat treatment on flexibility of Butyl. (The more flexible sample was heat treated).

The measurements of Figure 1 were made with a conventional tensile tester (Model ORR-L5, Scott Testers, Inc.) which does not permit one to assess the earliest portion of the stress-strain curve. Other data (Figure 20) will show that the curves cross at low extension, around 100 to 150 per cent, and that below this point heat-treated compounds develop lower modulus than the control. Correspondingly, in the present set of vulcanizates the Shore hardness decreases 10 points (from 60 to 50) as a result of cyclic heat treatment. Also, dynamic compression modulus at small amplitudes is reduced 25 per cent. Flexibility is increased to such an extent that the sample loses much of the stiffness normally associated with compounds of this type (Figure 2).

Since the effects in Figure 1 resemble those which are obtained by advancing the state of cure, one might assume that heat treatment served only to accelerate cure rate. If this were so, these effects would diminish or disappear for higher states of vulcanization. To test this point, a series of cures was prepared from both control stock and from stock alternately heated and milled 12 times. The 300 per cent modulus of the resulting vulcanizates is plotted against time of cure in Figure 3. The curves are roughly parallel and indicate little if any difference in cure rate. It appears from this that modulus is enhanced by heat treatment to an extent depending only on the heat treatment.

Effect on Dynamic Properties: The resilience of Butyl vulcanizates is greatly improved by heat treatment. This is demonstrated by the reduced energy losses experienced under low frequency vibration conditions. Resilience measurements were made with the Yerzley Oscillograph as modified by Baldwin *(1)*. This test determines the internal viscosity, η, of the vulcanizate at a frequency f; the product ηf is proportional to absolute damping or energy loss, and is inversely proportional to the elasticity.

Figure 4 shows the effect of cyclic heat treatment on the damping characteristics of the present Butyl-channel black systems. Measurements of ηf were made at 30, 50 and 70°C. on vulcanizates cured for 20 minutes at 307°F., and these damping values are plotted logari-

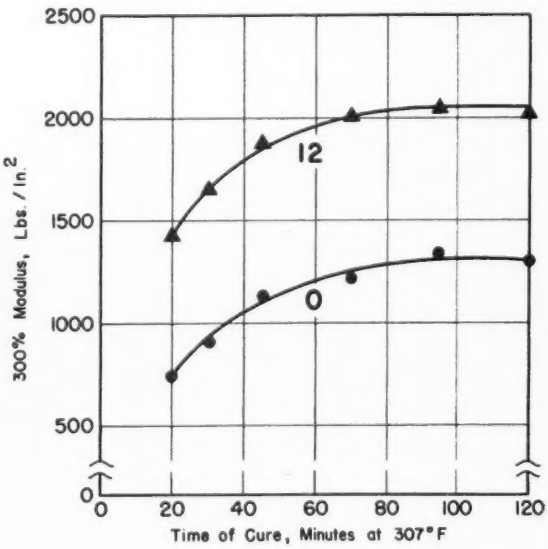

FIG. 3—Cure rate curves for control and heat-treated compounds. (The numbers refer to the number of cyclic heat treatments).

A Word of Explanation.....

For the past few years the Esso Laboratories of the Standard Oil Development Company have been working on a new method of heat treating Butyl Rubber. The results have indicated that Butyl Rubber vulcanizates can be produced with more resilience than any produced heretofore. In addition, other increases in physical properties can be achieved which indicate a far greater application for the polymer in the future.

With this issue we are beginning the publication of four or more articles covering the investigations of the Esso Laboratories along these lines. The articles will appear under the general head of "The Reinforcement of Butyl with Carbon Black." The first article, published herewith, is devoted to the methods and effects of heat treatment and evidence is presented to show that the improved reinforcement results from both improved dispersion and increased carbon-to-polymer bonding.

The enhancement of Butyl vulcanizate quality by unmodified heat treatment requires the presence of oxygen on the carbon black surface, and this will be the subject of the second paper. Proof will be presented that channel blacks respond to heat treatment whereas furnace and thermal blacks do not. However, even though furnace and thermal black surfaces are practically devoid of oxygen, mixtures of these blacks with Butyl can be effectively heat treated with the aid of certain chemical promoting agents, such as sulfur and p-dinitro benzene, and this will be discussed in the third paper.

It was obligatory in this investigation that the effects of polymer unsaturation and molecular weight be studied systematically. Accordingly, the fourth paper covers such effects and indicates that while the improvements resulting from heat treatment increase with increasing unsaturation of the polymer, they are practically independent of molecular weight. This portion of the series will also present a phenomenological theory of the heat treatment mechanism.

Laboratory investigations are not always guarantees of field performance, but in this instance actual field tests of finished products, including tires, seem to corroborate the findings covered in this series. We hope to present field test results as part of this series of articles in the near future.

EDITOR

thmically against the reciprocal temperature. The family of parallel lines shows that damping is highest in the control compound and decreases steadily with repeated heat treatment. The percentage improvement after a given number of cycles is independent of temperature in the range studied.

Since plasticizers or softeners are commonly used to improve elasticity in rubber compounds, it is interesting to compare the properties of plasticizer-free vulcanizates that have been heat treated with those of plasticized vulcanizates without heat treatment. After six cycles of heating and milling, damping is reduced about 50 per cent in a Butyl vulcanizate containing channel black. An equivalent damping reduction without heat treatment requires the use of fairly high concentrations of plasticizer; for example, 15 parts (per 100 of polymer) of a good hydrocarbon oil such as an acid-treated paraffinic distillate. Furthermore, plasticization, in contrast to heat treatment, improves damping only at the expense of other related properties. This important difference is shown in Table II, where the property changes are expressed as percentages based on the control.

Effect on Electrical Properties: Reinforcement is commonly regarded as resulting from attractive forces between polymer and black *(2-5)*. In accordance with this view, there is evidence in the present work that heat treatment either modifies these forces or else generates them in additional quantity. Cyclic heat treatment also

TABLE II—EFFECT OF HEAT TREATMENT AND PLASTICIZATION ON PHYSICAL PROPERTIES OF BUTYL

Property	% Change * Heat-Treated (6 Cycles)	% Change * Plasticized (15 Parts of Paraffinic Distillate Oil [1])
Damping (ηf at 50° C.)....	—52.0	—53.7
Tensile Strength	+11.0	—15.0
Modulus (300%)	+87.0	—48.0
Extensibility	—18.6	+11.1

* Plus denotes increase; minus denotes decrease. [1] Forum 40 was used.

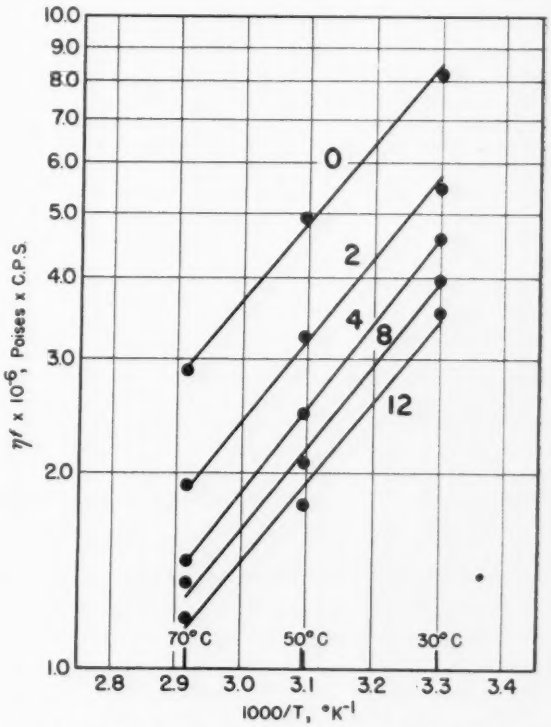

FIG. 4—Effect of cyclic heat treatment on damping properties of Butyl. (The numbers refer to the number of cyclic heat treatments).

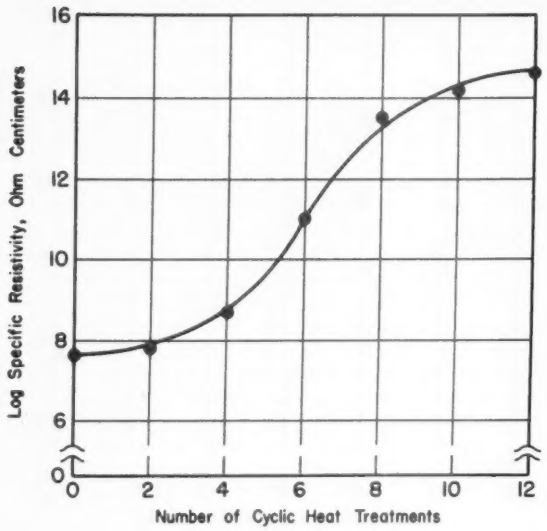

FIG. 5—Effect of cyclic heat treatment on electrical resistivity of Butyl.

appears to produce important changes in carbon dispersion. Thus, a dual mechanism is envisioned in which dispersion and carbon-polymer interaction play interdependent parts.

Dispersion changes can be postulated from electrical conductivity measurements. The parallelism between improvement in dispersion and increase in electrical resistivity receives considerable support from the literature *(6-9)*. Figure 5 shows how the electrical resistivity of the present Butyl systems is affected by cyclic heat treatment. It rises slowly at first and then more rapidly, between the 4th and 8th cycles. This behavior does not correlate with the effect of cyclic heat treatment on modulus and damping. Figures 1 and 4 show that the latter properties undergo the largest changes in the first few cycles, and then change more slowly as the process is continued. If we assume that the changes in modulus and damping result from modified carbon-polymer interaction forces, then it must be concluded, on the basis of Figure 5, that these modifications occur without appreciable alteration in pigment dispersion, at least in the first few cycles.

Figure 5 shows that additional heating and milling eventually disaggregates carbon clusters with attendant formation of new carbon surface. We can thus explain these observations on the basis of two interdependent processes: (a) heat treatment produces enhanced anchorage of polymer to carbon (in clusters as well as single particles); (b) subsequent milling steps disaggregate carbon clusters by virtue of the enhanced anchorage. The latter result makes available new surface for further anchorage generated by additional heating. The combination of these factors leads to a more or less steady increase in the heat treating effect. Further evidence supporting this explanation will be presented later.

TABLE III—EFFECT OF CYCLIC HEAT TREATMENT ON ABRASION LOSS OF BUTYL VULCANIZATES

Description of Sample	Grams Loss/Kilometer — Single Values		Average
EPC Black, Control, No Heat Treatment	0.289	0.316	0.307
EPC Black, 12 Cyclic Heat Treatments	0.196	0.225	0.211

TABLE IV—EFFECT OF MILLING WITH AND WITHOUT APPLIED HEAT ON PHYSICAL PROPERTIES OF BUTYL VULCANIZATES

Extent of Masterbatch Milling	Control, No Additional Milling	Milled 1 Hour at 80-90° F.	Milled 1 Hour at 305-310° F.
Modulus at 100%, lbs./in.²	300	200	200
200%	425	375	550
300%	775	750	1125
400%	1250	1250	1700
500%	1850	1875	2200
600%	2500	2525	——
Tensile Strength, lbs./in.²	3025	3075	2625
% Ultimate Extension	700	705	600
Damping, $\eta f \times 10^{-6}$, Poises × C.P.S., 50° C.	4.97	4.71	3.07

Effect on Abrasion Resistance: The abrasion resistance of Butyl vulcanizates is improved markedly by heat treatment. The effect of heat treatment on the abrasion resistance of a channel black compound (cured for 60 minutes at 300°F.) was determined with a Lambourn Abrader. Tests were made in duplicate and the results, expressed as weight loss per kilometer run, are shown in Table III.

Effect of Milling: The vulcanizate changes resulting from cyclic heat treatment are not brought about by milling alone. The latter is effective, as will be described later, only when heat is also applied, either prior to or in conjunction with the milling step. Masterbatches with channel black were milled for 1 hour with the mill rolls at 80-90°F. and 305-310°F., respectively. The time selected here is the same as that in 12 cycles of heat treatment. Vulcanizing agents were added after the milling, and the compounds were cured for 20 minutes at 307°F. Data in Table IV compare the physical properties of the milled samples with those of a conventionally mixed compound. No improvement in physical properties is realized without applied heat.

Heat Treatment and Carbon Type

The desirable effects of heat treatment obtained with channel blacks cannot be obtained with other types of blacks unless certain modifications are made either in the black or in the compound. Companion papers give the details of these modifications. The purpose of this section is merely to show that, in the absence of such modifications, little improvement is realized.

Two masterbatches were prepared, with SRF black (Gastex) and MPC black (Kosmobile 66), respectively. A portion of each masterbatch was taken for the control and the remainder was subjected to cyclic heat treatment. The compounds were cured for 20 minutes at 307°F. The modulus and damping properties of the two black systems are compared in Figures 6 and 7, respectively, as functions of the extent of heat treatment. With MPC black, the stress at 300 per cent is increased more than 100 per cent. With SRF black, the total change, 5 per cent, is within the limits of experimental error. Corresponding reductions in ηf are 63 and 12 per cent, respectively.

Electrical resistivity data indicate that the dispersion

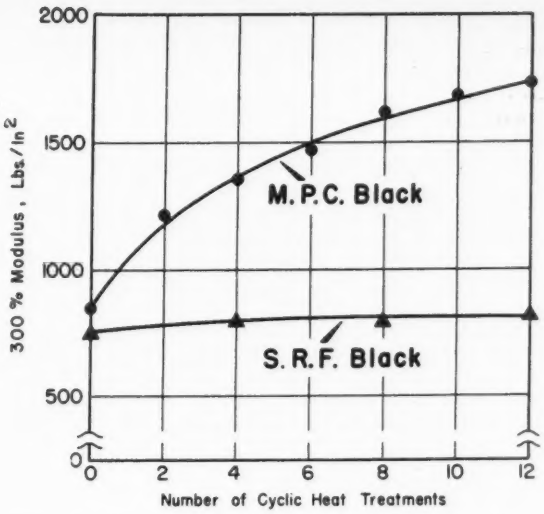

FIG. 6—Dependence of heat treatment on carbon black type: modulus.

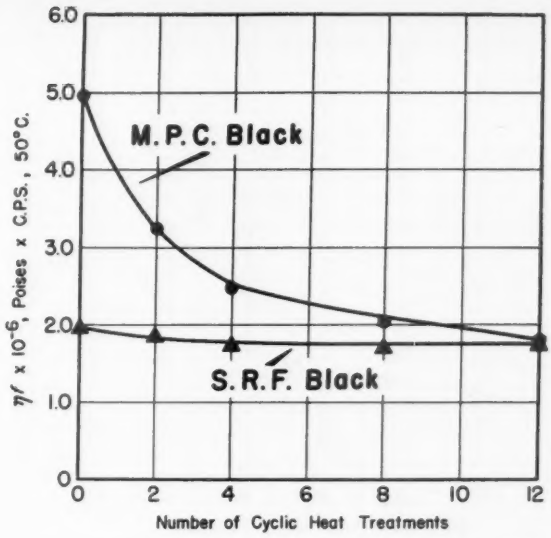

FIG. 7—Dependence of heat treatment on carbon black type: damping.

of a typical furnace black compound is not improved by heat treatment (Figure 8). It is important to emphasize that these results apply exclusively to the cured compounds. Conventionally mixed masterbatches (the controls), regardless of carbon type, are tough, dry, grey and non-lustrous in appearance. On thermal treatment, they become softer and less dry, as if plasticizer were being added. Intense black color is obtained and freshly cut surfaces exhibit high luster. These are all signs of improved dispersion, and, in fact, heat-treated batches have been found to calender and extrude more smoothly than the corresponding controls. Thus, it appears that heat treatment improves dispersion in the uncured compound, but that this improvement disappears on vulcanization.

Ford has shown *(9)* that by varying the mixing technique, the state of dispersion of furnace black in Butyl could be changed greatly, the electrical resistivities of the uncured mixes varying from 10^5 to 10^{14}. Nevertheless, when these mixes were cured, the resistivities all dropped to a value of the order of 10^5, which was roughly that of the poorest dispersion. The reversibility of dispersion effects was thus demonstrated with SRF black. Since in the present work only cured compounds were considered, it is not surprising that no changes were found in the electrical resistivity from unmodified heat treatment. A following paper will show that modified heat treatment can preserve the benefits in vulcanized stocks.

Many workers *(7, 10, 11, 12)* have noted the decrease in electrical resistivity on heating thoroughly milled samples of rubber and carbon black. Presumably, carbon black flocculates are broken by milling but are re-formed when the mobility of the system is enhanced by heating. Blanchard and Parkinson *(5)* have offered evidence that strong linkages may also be formed between carbon and rubber. In their work, remilling of rubber-black stocks following heat treatment under certain conditions was found to break down carbon chain structure permanently and electrical resistivity remained unchanged on further heating. In our view, forces between polymer and black generated by heat treatment anchor the black particles, and these cannot then be re-formed into the carbon chain structure when the mass is heated. Such forces are established with channel black, but apparently not to any considerable extent with furnace black. Their absence in the latter case is believed to account for the flatness of the modulus and damping curves (Figures 6 and 7) and for the reversible dispersion effect which fails to show in the vulcanizate the same improvements which are apparent in the raw stock.

Experiments of the type just described were performed with other types of non-channel blacks. These included HMF (Philblack A), HAF (Philblack O), FF (Statex B), FT (P-33), MT (Thermax) and CF (Shawinigan Black). All showed the same inactivity toward heat treatment that characterized SRF black. Only HAF and SRF compounds were used in abrasion tests and no advantage was demonstrated as a result of heat treatment.

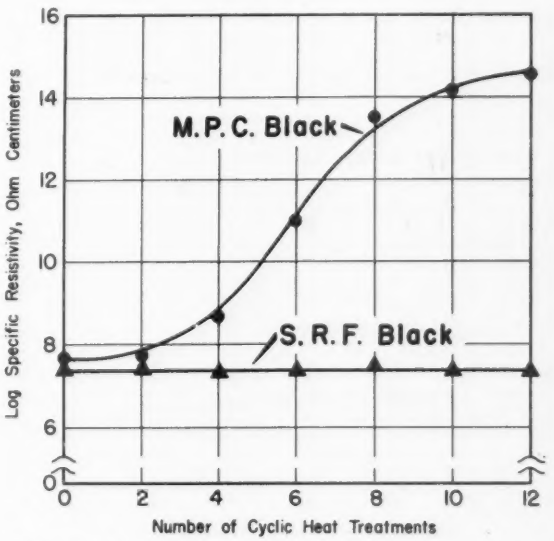

FIG. 8—Dependence of heat treatment on carbon black type: electrical resistivity.

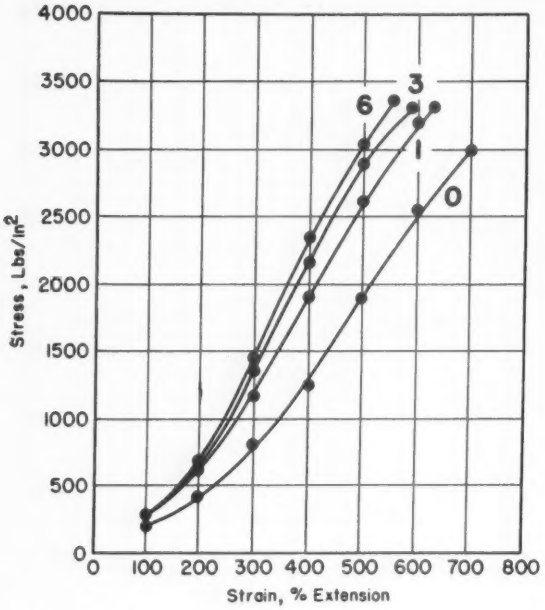

FIG. 9—Effect of static heat treatment on stress-strain properties of Butyl. (The numbers refer to hours of static heating).

Static Heat Treatment

The stress-strain curves in Figure 9 illustrate the effect of static heat treatment on a Butyl system with EPC black. The masterbatch was heated for varying periods of time in open steam at 320°F. without alternate milling. Compounding was completed in 5 minutes on the open mill and the stocks were cured for 20 minutes at 307°F. Comparison of Figures 9 and 1 shows that similar changes in the stress-strain curve are obtained from cyclic and static heating.

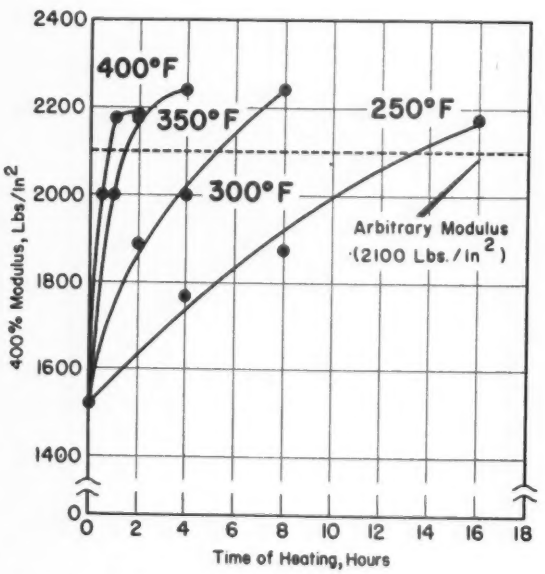

FIG. 10—Effect of static heat treating temperature on rate of modulus attainment.

The efficiency of static heating depends on time and temperature. This is demonstrated by the following experiment: Portions of a Butyl-MPC black masterbatch were wrapped in tin foil and were heated for various times in thermostat baths at 250, 300, 350, and 400°F. The compounding and curing (40 minutes at 307°F.) were then completed, and stress-strain curves were obtained. The 400 per cent modulus versus time of heating is plotted in Figure 10 for each temperature of heat treatment. The rate of response is seen to increase sharply with increasing temperature. If the time required to reach some arbitrarily chosen modulus level (2100 lbs./in.², dashed line in the figure) at a given temperature is taken, the results may be expressed in a more direct relationship. This is shown in Figure 11, in which the time in hours to reach 2100 lbs./in.² stress is plotted logarithmically against the reciprocal absolute temperature of heat treatment. It is seen that for a given increase in modulus the time of heating may be reduced by about one-third for each 50°F. rise in temperature. The slope of the plot yields an activation energy of about 16 kilocalories per mole. The significance of this value is not known to the writer.

Static heat treatment is generally less effective than cyclic heat treatment. Figure 12 shows the changes in modulus and damping for the two processes over an extensive time period. One hour of static heating is thermally equivalent to two alternate heating and milling cycles. This is shown by the double scale on the abscissa. Samples from a common masterbatch were statically and cyclically heat treated as already described. The vulcanizates were cured for 45 minutes at 307°F. A Butyl rubber of lower diolefin content (GR-I-70) was employed here in place of the polymer (GR-I-17) used in

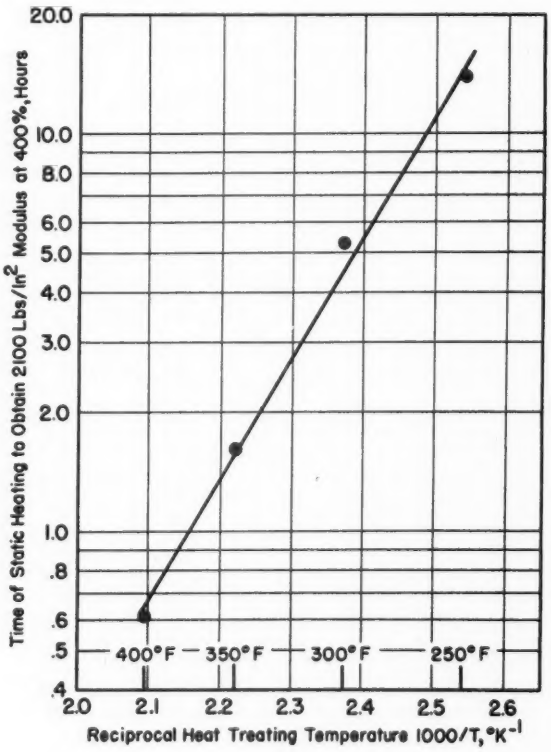

FIG. 11—Time-temperature relationship for effect of static heat treatment on modulus.

all the other sections of this paper. This accounts for the lower level of the modulus data in the graph.

In Figure 12, the changes which accompany cyclic heat treatment continue throughout the full course of the extended process. In contrast, the effects of static heating are smaller, and more particularly, reach limiting values. Consideration of these data, and of the fact that static heating, unlike cyclic heating, was observed to produce little or no change in the electrical resistivity of the vulcanizate (Figure 13), gives further insight into the mechanism of reinforcement and heat treatment.

As already stated, it is assumed that additional forces of attachment are created between polymer and black by heat treatment. Whatever the nature of these forces, they may come into being under the influence of heat alone whenever a pair of reactive sites (the term "reactive" being used here in the most general sense to include both physical and chemical bonding) comes within a certain reaction range. Many pairs will be close enough to each other in the original physical mixture (conventionally milled polymer and black) and they will associate when heat is applied to the system. Other pairs,

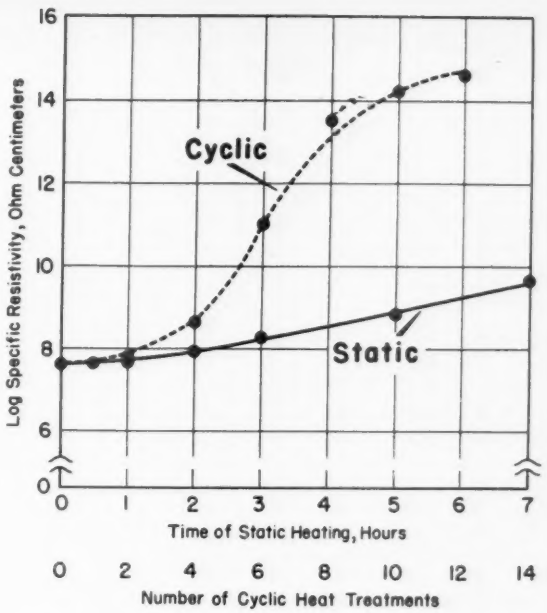

FIG. 13—Effect of type of heat treatment on electrical resistivity of Butyl.

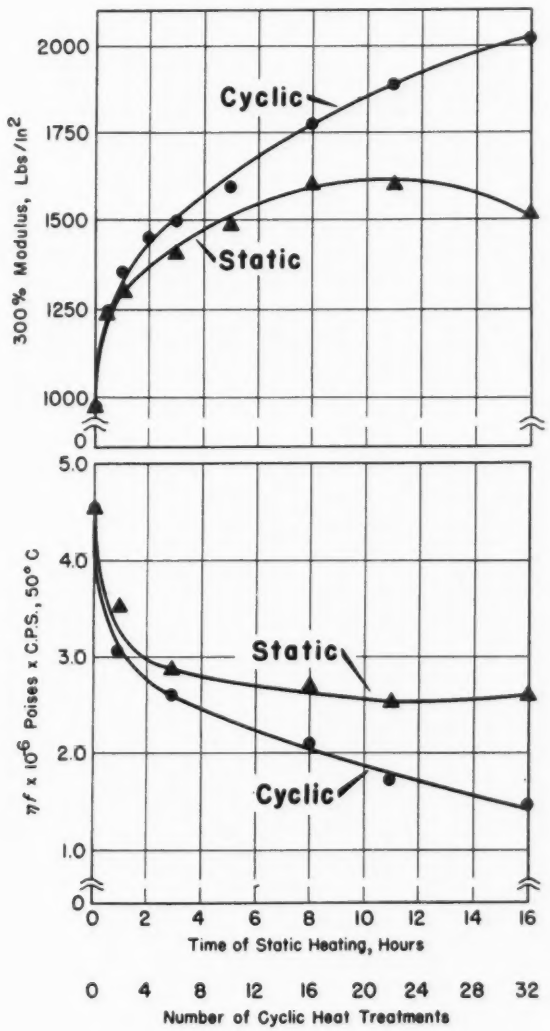

FIG. 12—Effect of type of heat treatment on modulus and damping properties of Butyl.

situated outside of the mutual reaction sphere but within a region of proximity, will come together as a result of thermal motion. The linking of originally paired sites proceeds relatively quickly and these linkages, it is believed, account for reinforcement as normally encountered in vulcanized rubber articles. Other pairs cannot be expected to enter into the picture in this case (no pretreatment) because the mobility of the system is restrained by vulcanization. These views are consistent with the data, which show that the extent of reinforcement is enhanced by static heating. A number of potentially reactive pairs lying outside of the zone of "rapid reaction" will be prevented from colliding under the influence of thermal motion by the polymer chain restraints imposed by the preformed linkages of the closely situated sites. The magnitude of the heat effect on reinforcement properties would therefore be expected to attain a limiting value.

Unlike those in static heating, the changes which accompany cyclic heating continue without limit. As Ladd and Wiegand *(13)* pointed out, the original reticulate structure of carbon black may be largely preserved after milling in rubber. Polymer-black associations in such cases must involve clusters or chains of carbon particles. Once a cluster is anchored to the polymer chain it loses its capacity to resist disintegration by the polymer stresses induced through milling. Fragments may thus be torn off with the result that new areas are exposed for further interaction with the polymer. Continued repetition of this sequence of events, as in cyclic heat treatment, would therefore culminate in the maximum number of polymer-carbon linkages (greatest reinforcement) and most nearly ideal condition of pigment dispersion. This concept would explain the nature of the cyclic heating curves shown in Figure 12.

The concept of carbon clusters does not alter the picture already developed in the case of static heating. The latter systems are milled finally to incorporate curing agents. Clusters of black will be broken by this milling and to an extent which depends on the number

TABLE V—FORMULATIONS FOR CONCENTRATION STUDIES

Masterbatches						
Butyl Rubber (GR-I-17)	100.0	100.0	100.0	100.0	100.0	100.0
MPC Black	20.0	30.0	40.0	50.0	60.0	70.0
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5
Curing Agents						
Zinc Oxide	5.0	5.0	5.0	5.0	5.0	5.0
Sulfur	2.0	2.0	2.0	2.0	2.0	2.0
Tetramethyl Thiuram Disulfide	1.0	1.0	1.0	1.0	1.0	1.0
2,2'—Benzothiazyl Disulfide	1.0	1.0	1.0	1.0	1.0	1.0

of clusters attached and on the number of attachments per cluster. Both of these tend to increase with the time of heating, a fact which appears to account for the moderate changes in electrical resistivity which accompany static heat treatment (Figure 13). Competing reactions arising from polymer oxidation have been ignored in these interpretations. They will, of course, impose limitations on the extent to which any heat treatment can profitably be carried.

Carbon Black Concentration Studies

The preceding discussion pertains to only one filler concentration. What limitations, if any, are imposed on heat treatment by concentration effects? Can the desirable effects of heat treatment be preserved if the concentration of pigment is reduced by adding raw polymer to a system previously subjected to a heat process? The practical importance of the latter question is obvious.

The formulations used in answering these questions are given in Table V. Two approaches were used for preparing these compounds. In the first, the *direct approach,* masterbatches were mixed, in the proportions shown, on a 6x12-inch mill. One half of each was retained for control and the other half was heated for 6 hours in open steam at 320°F. In the second, the *dilution approach,* a large portion of masterbatch was prepared with 70 parts of black (per 100 parts of polymer). One half of the latter was heat treated as just described. Portions of this and of the unheated half were then compounded with raw polymer to give the final filler concentrations shown in Table V. This operation consumed only 5 minutes on the 6x12-inch mill. Curing agents were added finally to all compounds and the latter were vulcanized for 45 minutes at 307°F. Stress-strain and damping properties were then measured.

The formation of polymer-black associations under static heat conditions has already been discussed. On this basis, the number of reactive sites, and hence the number of associations, should be increased if more black is added to the system. It is not surprising, therefore, to find in the present set of Butyl compounds that the magnitude of the change which results from heat treatment is proportional to the concentration of carbon black, as shown in Figure 14. On extrapolation, the modulus plot intersects the abscissa at 10 parts of black and no effect of heat treatment is indicated in this low range. Modulus is increased in conventionally mixed systems as more filler is added. It is increased further by heat treatment, by about 160 p.s.i. for each additional 10 parts of black in the range between 10 and 70 parts. Corresponding improvement in damping shows a similar, though nonlinear, dependence on filler concentration. The greatest changes appear at the highest filler concentrations. Figure 14 contains data from both the direct and dilution approaches. No significant differences are indicated for the two techniques. The practical advantages of the dilution technique can therefore be enjoyed without loss in product quality.

Plasticized Systems

If the Butyl rubber compound is to contain plasticizer, the latter should be added after the heat treatment process. Stress-strain data in Figure 15 illustrate this point. An MPC masterbatch was divided into three equal parts. Plasticizer was added to one of these without heat treatment, and to the others before and after the heat treatment, respectively. An acid-treated paraffinic distillate oil (Forum 40) was used as the plasticizer in a ratio of 10 parts per 100 parts of polymer. The addition in each case was made in 10 minutes on the 6x12-inch mill. Static heating was conducted for 4 hours in open steam at 320°F. Curing agents were then added in the usual fashion and the compounds were vulcanized for 20 minutes at 307°F. The results in Figure 15 indicate a parallel between heat treatment and vulcanization. As

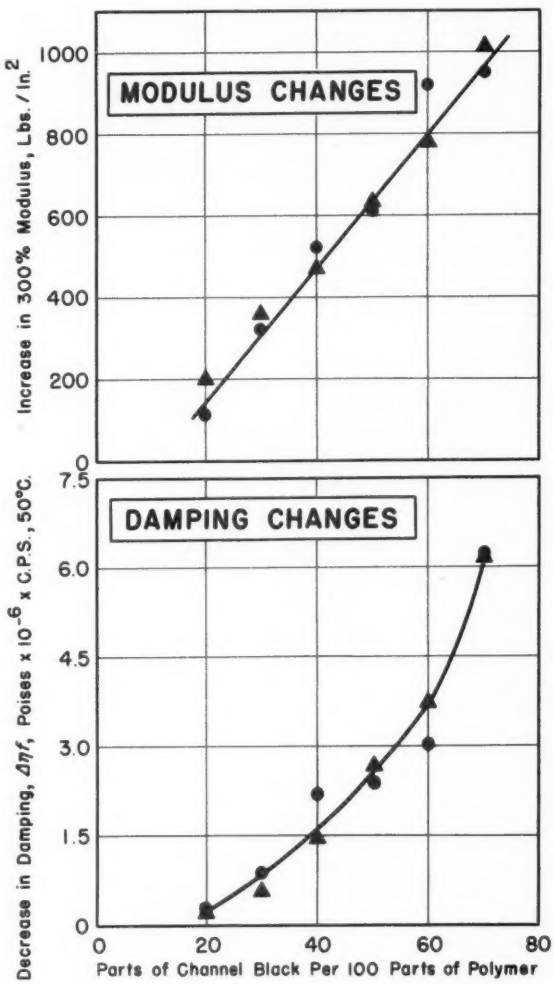

FIG. 14—Effect of carbon black concentration on changes in modulus and damping resulting from heat treatment. (The circles denote direct mixes; the triangles denote diluted mixes).

TABLE VI—EFFECT OF DYNAMIC HEAT TREATMENT ON PHYSICAL PROPERTIES OF BUTYL VULCANIZATES

	No Heat Treat. Control	Heat Treat. No Polyac	Heat Treat. Polyac
Mooney Viscosity, 8′ at 100° C.	90	76	74
Modulus at 100%, lbs./in.^{2}....	260	285	290
200%	600	750	910
300%	1170	1510	1930
400%	1850	2300	2920
500%	2600	3050	——
600%	3275	——	——
Tensile Strength, lbs./in.^{2}.....	3415	3425	3415
% Ultimate Extension.....	620	560	465
Damping, $\eta f \times 10^{-6}$, Poises × C.P.S., 50° C.....	4.89	3.67	2.13

Flory *(14)* has pointed out, the extent to which a polymer network is cross-linked is less when the plasticizer or diluent is added before, rather than after, vulcanization. Here, an analogous process is seen, except that different types of bonds are involved, namely those at the polymer-carbon black interface.

Resilience changes in these compounds parallel the modulus changes. Damping data are given below to show the effects:

Plasticizer Added	$\eta f \times 10^{-6}$, Poises × C.P.S., 50° C.
Without Heat Treatment	3.57
Before Heat Treatment	2.80
After Heat Treatment	1.59

Dynamic Heat Treatment

The static and cyclic methods of heat treatment are excessively time-consuming, from a practical point of view. We shall now discuss a more practical method of obtaining similar results. Here, the masterbatch is heated and simultaneously masticated on a mill or preferably in a Banbury. High temperatures, in the range between 400 and 500°F., are required for optimum results in short periods. The action is promoted by the use of suitable agents. An example of this procedure is given below.

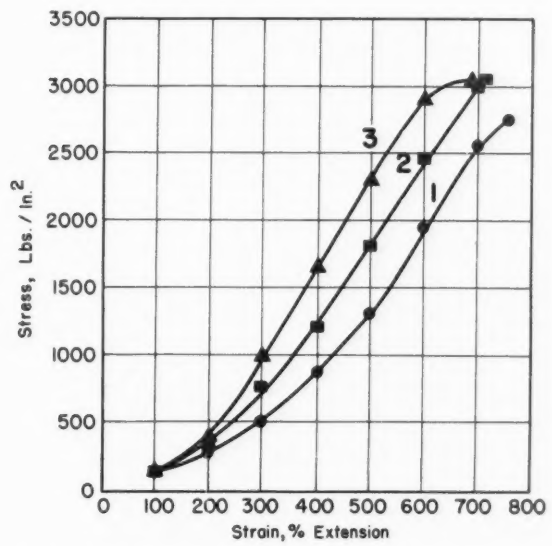

FIG. 15—Effect of plasticizer on heat treatment. (1) Plasticizer added without heat treatment. (2) Plasticizer added before heat treatment. (3) Plasticizer added after heat treatment.

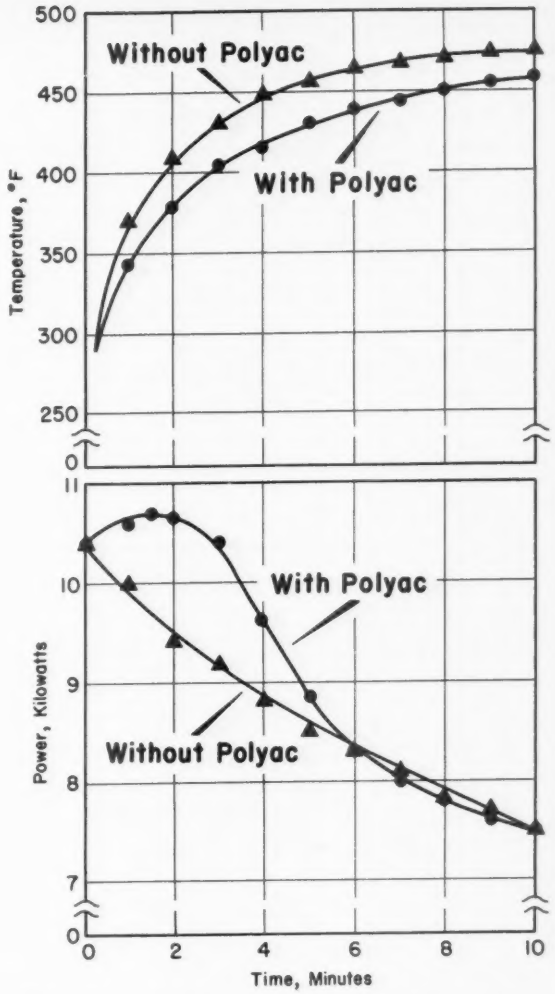

FIG. 16 — Temperature and power records for dynamic heat treatment in a Banbury mixer.

Three charges of an MPC black masterbatch were prepared in a 00 Banbury. Cooling water was employed to hold the dump temperatures in the range 230-240°F. The charges were then blended on an open mill and divided into three parts. One part was not treated further. The second part was Banburyed as described below. The third part was similarly Banburyed after prior addition of 0.5 part of Polyac (30% p-dinitrosobenzene in 70% inert filler) per 100 parts of polymer. The latter two mixes were returned to the Banbury, which had been previously heated to about 400°F. The preheating was accomplished by supplying internal steam to the rotors and simultaneously working an extra charge of masterbatch for 20 minutes. (Factory Banburys, although not usually equipped with steam, are readily heated to this temperature level when masterbatch is masticated in the absence of cooling water. The writer, for example, experienced no difficulty in thus heating either a 3A or a No. 11 Banbury.)

At 400°F., the mixes were churned under full ram pressure for 10 minutes. The stock temperature during

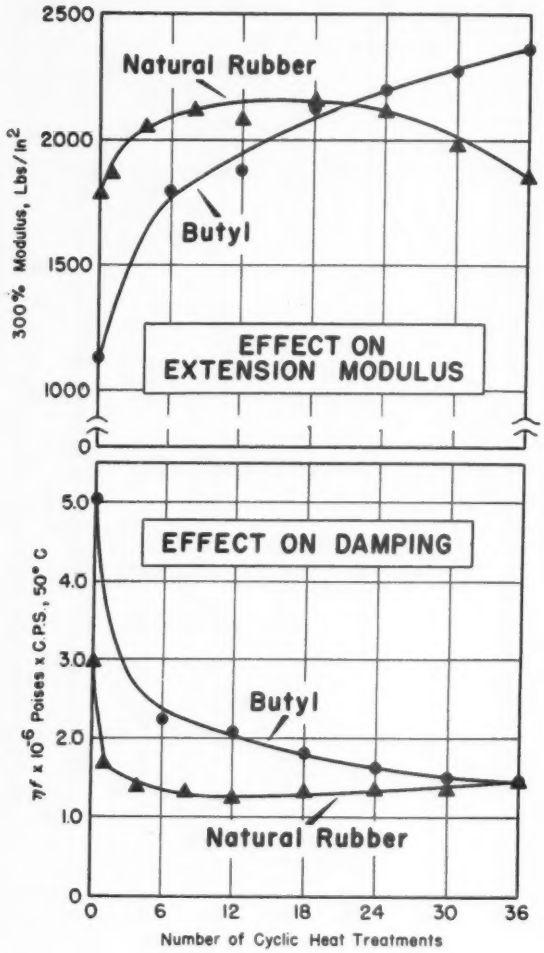

FIG. 17 — Effect of cyclic heat treatment on modulus and damping properties of Butyl and natural rubber compounds.

this period was measured by means of a thermocouple well projecting into the mixing chamber. Several batch temperatures were measured directly with a calibrated needle pyrometer during this process, and the thermocouple readings were corrected accordingly (the correction being in the order of 40°F.). The power requirements of the operation were obtained from a wattmeter attached to the Banbury motor. Temperature and power histories are summarized in Figure 16. After completion of the process, the two heat-treated batches and the control were further compounded in the usual manner and cured for 45 minutes at 307°F. Data in Table VI show some results which were obtained from this work.

The effect of added promoting agents will be considered in detail in a companion paper. Here, we only demonstrate the promoting effect (Table VI) and make a few remarks about the process. Polyac undergoes two reactions when the polymer system is heated. One of these is known to be a cross-linking reaction *(15)* in which the dinitroso compound serves to link together polymer chains. The second, it is believed *(16)*, is a reaction which serves to associate polymer and black in a more or less permanent fashion. The reactions proceed concurrently and the total effect is additive. Evidence for the reactivity of Polyac is found in the power curves of Figure 16.

When Polyac is not present in the masterbatch, the power requirements decrease steadily. This decrease is probably the combined result of thermoplasticity, polymer breakdown, and improved dispersion *(8)*. With Polyac present, on the other hand, it is seen from the initial rise in the wattmeter curve that the batch stiffens during the first few minutes of running. The sharp decline in power requirement after the maximum reveals that the combined changes referred to above take place at a greatly increased rate. It is interesting to note that the power requirements of both masterbatches are the same at the end of the run, a fact which is further illustrated by the Mooney data in Table VI.

Heat Treatment of Natural Rubber and GR-S Systems

Early patents issued to the Firestone Tyre and Rubber Co., Ltd. *(17)* and to the United States Rubber Products, Inc. *(12)* claimed that improved properties were obtained when natural rubber-black systems were heated prior to vulcanization. In the latter patent, vulcanizate changes were described for carbon black mixtures that had been milled either during or after the heating operation. Additional patents *(18)* claimed that organic compounds such as benzidine and urea could be used to promote the effects of heat treatment. The work was further extended by Parkinson and Blanchard *(7)*, who found similar results with GR-S. These references all disclose that heat treatment leads to an increase in modulus (above about 300%), a small decrease in tensile and tear strengths, and increases in resilience, abrasion resistance, and electrical resistivity.

Because of the apparent similarity between the present work and that referred to, it was desired to compare Butyl rubber with natural rubber and GR-S. The experiments conducted toward that end clearly established definite advantages for Butyl rubber in respect to the practicability of heat treatment.

When compared with that of Butyl rubber, the heat treatment of natural rubber is subject to serious limitations. Improvements in vulcanizate properties are offset by the competitive action of oxidative degradation and the net benefit is therefore relatively small. Figure 17 shows that, with natural rubber, the modulus is increased slightly and damping is decreased during the first few cyclic heat treatments. The observed plateaus may result from a condition in which the beneficial effects of heat treatment are counterbalanced by the deteriorative changes associated with polymer breakdown. A point is eventually reached where the influence of oxidative

TABLE VII—EFFECT OF CYCLIC HEAT TREATMENT ON TENSILE STRENGTHS OF BUTYL AND NATURAL RUBBER VULCANIZATES

No. of Cyclic Heat Treatments	Tensile Strength, Lbs./In.²	
	Butyl Rubber	Natural Rubber
0	3200	3640
1	—	3315
4	—	3160
6	3340	—
12	3300	2640
18	3520	2700
24	3430	2710
30	3300	2170
36	3315	2030

TABLE VIII—FORMULATIONS FOR BUTYL, NATURAL RUBBER AND GR-S COMPOUNDS

Masterbatches for Heat Treatment			
Butyl (GR-I-17)	100.0	—	—
Smoked Sheets	—	100.0	—
GR-S (LTP)	—	—	100.0
MPC Black	50.0	50.0	50.0
Stearic Acid	0.5	0.5	0.5
Phenyl-β-Naphthylamine	—	1.0	1.0
Curing Agents			
Zinc Oxide	5.0	3.0	5.0
Stearic Acid	—	2.5	0.5
Tetramethylthiuram Disulfide	1.0	—	—
2,2' Benzothiazyl Disulfide	1.0	—	1.5
2-Mercaptobenzothiazole	—	1.0	—
Sulfur	2.0	3.0	1.75

effects gains the upper hand and the curves regress from their plateau positions.

The behavior of Butyl rubber is significantly different. The beneficial changes persist throughout the full course of the heat treating process. It is well known that Butyl compounds can be milled for long periods without adversely affecting the vulcanizate. Use of Butyl rubber in such applications as tire curing bags attests, in addition, its remarkable heat resistant qualities. From the standpoint of molecular behavior, Butyl rubber is not degraded appreciably by the present series of heating and milling operations. In the absence of oxidative degradation, heat treatment proceeds in a positive direction without restraint, and this accounts for the magnitude of the effects shown.

Further evidence of the important difference in the behavior of natural rubber and Butyl rubber under heat treating conditions is illustrated by the tensile data in Table VII. The severe loss in the tensile strength of the natural rubber vulcanizate after protracted treatment is attributable to polymer degradation. The compounds in this work were prepared with MPC black, following the formulations in Table VIII. Cyclic heat treatment was carried out in the usual manner. The natural rubber and Butyl rubber compounds were cured for 25 and 45 minutes at 307°F., respectively.

GR-S occupies an intermediate position between Butyl and natural rubber in its response to heat treatment. Careful control is again necessary to avoid the undesirable effects of oxidation which, in this case, lead to a stiffening of the vulcanizate and concomitant losses in breaking strength and extensibility. Figure 18 shows the effect of cyclic heat treatment on the tensile strength and 200 per cent modulus of a "cold rubber" GR-S (X-485) compound containing channel black. The plateaus of the curves have been extrapolated to show the total additional reinforcement resulting, on heat treatment, from carbon-polymer interactions only.

Continuation of the heat treatment process beyond 12 cycles leads predominantly to polymer oxidation and produces sharp increases in modulus and decreases in tensile strength. The ultimate extensibility of the vulcanizates falls from 340 to 198 per cent during this portion of the heat treatment process, and the Mooney viscosity (3′ @ 100°C.) of the corresponding masterbatches increases from 84 to 94. The latter results, which resemble those of Dannenberg *(19)*, are evidence of an oxidative effect, since heat treatment is accompanied normally by reductions in Mooney viscosity (Table VI). The work in Figure 18 has been repeated with other

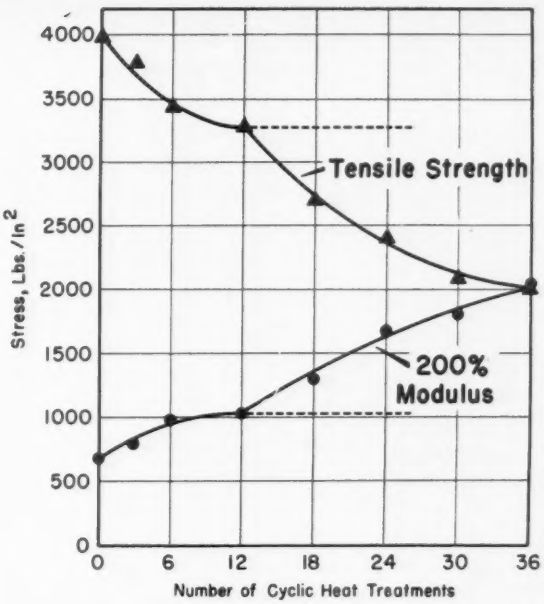

FIG. 18—Effect of cyclic heat treatment on modulus and tensile strength of a GR-S compound.

GR-S polymers and the same general results have been obtained. These experiments established the validity of drawing the curves in such a way that two separate processes are indicated.

TABLE IX—EFFECT OF HEAT TREATMENT ON PHYSICAL PROPERTIES OF BUTYL, NATURAL RUBBER, AND GR-S VULCANIZATES

	Butyl Rubber		GR-S		Natural Rubber	
	Control	Heated	Control	Heated	Control	Heated
Modulus at 100%	290	280	360	280	375	300
200%	675	900	860	760	1025	980
300%	1215	1850	1515	1710	1975	2125
400%	1900	2810	2290	2850	2950	—
500%	2675	—	2975	—	3975	—
600%	3275	—	—	—	—	—
Tensile Strength, lbs./in.²	3290	3550	3150	3150	4200	3100
% Elongation	605	500	525	420	505	370
Tear Strength, lbs./in.	345	240	300	160	630	110
Damping, $\eta f \times 10^{-6}$, Poises × C.P.S., 50° C.	4.70	2.18	6.02	3.57	2.25	1.50
Oven Aged—1 Week at 100° C.						
Modulus at 100%	225	215				
200%	610	650				
300%	1040	1300				
400%	1510	1915				
Tensile Strength, lbs./in.²	2100	2320				
% Elongation	540	480				
Tear Strength, lbs./in.	285	225				
% Tensile Retention	63.8	65.3				
% Elongation Retention	89.2	96.0	Severe degradation	Severe degradation	Severe degradation	Severe degradation
% Tear Strength Retention	82.6	93.7				

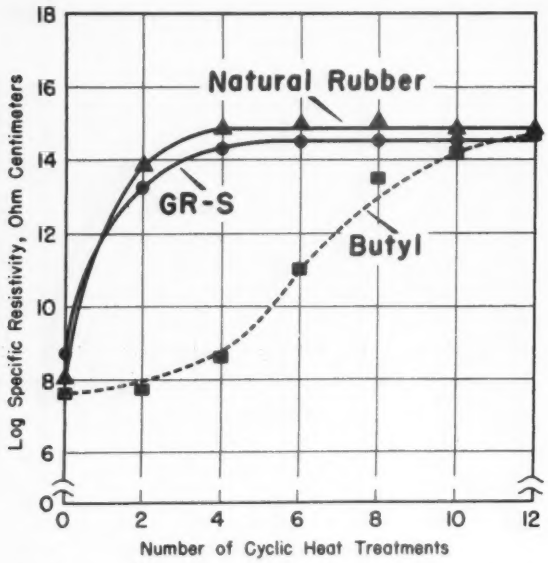

FIG. 19—Effect of cyclic heat treatment on electrical resistivity of Butyl, GR-S, and natural rubber compounds.

The data in Table IX were obtained under heat treating conditions which are very nearly optimum for both natural rubber and GR-S. The masterbatches (Table VIII) were heated for 4 hours in open steam at 320°F. and were intermittently milled in the conventional manner after each hour of heating. The GR-S and natural rubber compounds were cured for 25 minutes and the Butyl compound for 45 minutes at 307°F. Table IX shows that tear strength is diminished by heat treatment. The effect is less pronounced with Butyl than with natural rubber or GR-S. The good aging properties of Butyl rubber are well known. Heat treatment yields a slight improvement in this important property. Similar data are not reported for GR-S and natural rubber. Here the physical properties of the vulcanizates were so greatly reduced by the conditions of the test that no quantitative significance could be attached to the final values.

The dispersion of channel black in natural rubber and GR-S is improved rapidly by cyclic heat treatment, as previously reported. Figure 19 shows how the electrical resistivity of the various vulcanizates changes with heat treatment. Cyclic heat treatment was performed in the conventional manner, using the compounds of Table VIII. The tendency for carbon black to flocculate when its rubber mixtures are heated has already been mentioned. It was postulated that polymer-black linkages immobilize the pigment and curtail flocculation during subsequent curing. As a result, high resistivity is maintained in the vulcanizate. Since these anti-flocculating forces are reflected in the high resistivities of the vulcanizates, as shown in Figure 19, the rate of establishment of such forces appears to be associated with the chemical unsaturation of the polymers. The resistivities of the various vulcanizates, however, approach a common level which is determined essentially by the resistivities of the polymers themselves. In the present work, resistivity values of the order of 10^{15} represent the limits of the measuring apparatus. The plateaus shown in Figure 19 may therefore be apparent rather than real. This possibility, however, does not affect the argument based on the rate of attainment of high resistivities.

Association Forces Between Carbon Black and Polymer

The effect of heat treatment on the bound rubber content of Butyl-channel black mixtures was investigated. With conventional masterbatches containing MPC black, the following results were obtained: In cyclohexane as solvent, 23.6 per cent of the polymer in the control mix was insoluble. After cyclic heat treatment for 2, 8 and 12 cycles, this value increased to 34.7, 37.6, and 42.5 per cent, respectively. This shows that not only does heat treating increase the amount of bound Butyl, but also that the interaction forces are sufficiently strong to withstand the milling steps following each heating period. For example, stock taken from the 8th cycle before milling was found to have 40.6 per cent insoluble polymer; after milling 37.6 per cent insoluble polymer remained.

Still other determinations of bound rubber were made using a series of solvents. Samples of a masterbatch which had been statically heated for 5 hours at 320°F. were immersed in each of 4 solvents. The procedure of Medalia and Kolthoff *(20)* was used in this work. Samples were run in duplicate, using about 0.15 gram of masterbatch immersed for 70 hours at 25°C. (±0.5°C.) in 400 c.c. of solvent. In cyclohexane, benzene, isooctane, and trichloroethylene, values of 39.1, 37.5, 38.4, and 36.1, respectively, were obtained for per cent of insoluble polymer. The close agreement of these bound rubber values, in each case roughly twice that of the control in the same solvents, again shows that the forces which bind Butyl and the black are not easily broken. It is

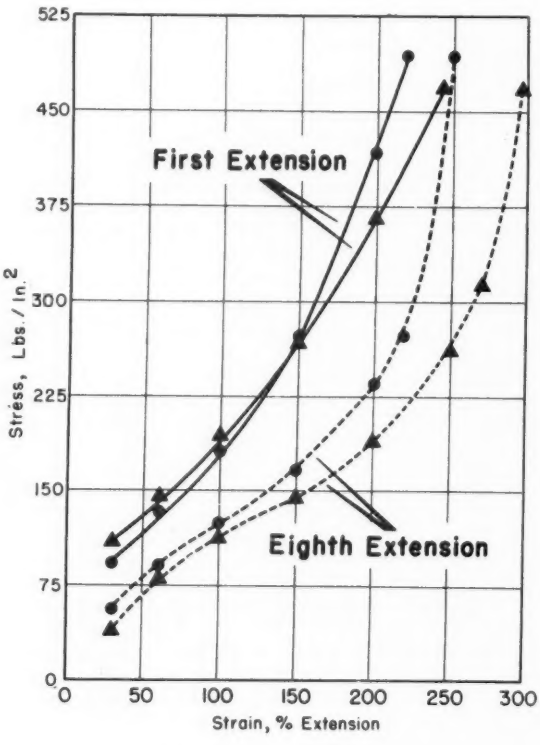

FIG. 20 — Effect of repeated stretching on the stress-strain properties of an untreated and a heat-treated Butyl compound. (The triangles refer to the untreated compound, and the circles refer to the compound after 6 cyclic heat treatments).

doubtful that secondary physical forces could withstand the shearing action of milling, or that such forces would give essentially equal bound rubber values in a series of solvents of varying solvent power.

In accordance with these views, Figure 20 shows stress-strain curves for a heat-treated and a control compound of Butyl and MPC black on the first extension (solid lines) and on the eighth extension (dashed lines). The measurements were made on a Scott Model IP-2 inclined plane tester; the magnitudes of the prestresses are shown by the highest points on the plots. The enhanced modulus resulting from heat treatment is retained on the eighth extension. If the capacity to resist prestressing is a characteristic of relatively strong or chemisorptive forces between polymer and carbon black, as Blanchard and Parkinson maintain *(5)*, then the results in Figure 20 are independent support for the deductions based on milling and bound rubber experiments mentioned above.

Finally, the improved acid resistance of the heat-treated vulcanizates, shown in Figure 21, is also attributable to both an increased number of carbon black-polymer linkages and better dispersion. The samples are pictured after 70 hours in concentrated sulfuric acid at 25°C. The effect of improved dispersion is to reduce wicking and thereby render more difficult the diffusion of the acid into the vulcanizate. The effect of increased bonding is to block off reactive sites on the polymer molecules, which thus become less reactive toward the acid.

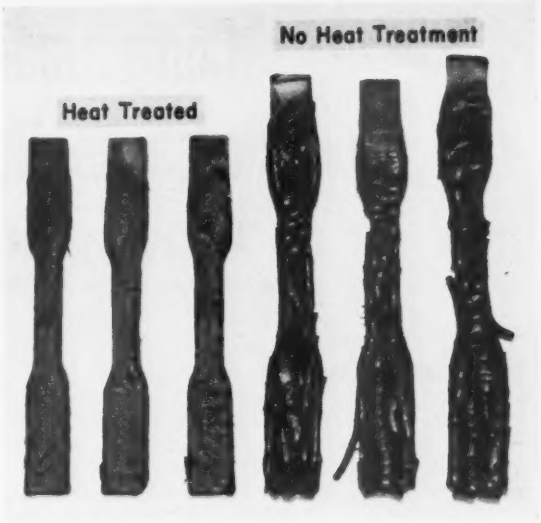

FIG. 21—Effect of heat treatment on the acid resistance of Butyl vulcanizates.

Summary

The heat treatment of Butyl-channel black mixtures leads to great improvement in the physical properties of the resulting vulcanizate. The modulus at higher extensions may be increased more than 100 per cent and the damping characteristics reduced more than 50 per cent. Tensile strength and abrasion resistance are also enhanced. Evidence is presented to show that the mechanism of the changes resulting from heat treatment is two-fold with carbon-polymer interaction and dispersion playing interdependent parts.

Blacks other than channel blacks do not respond in simple heat treatment with Butyl unless modifications are made either in the black or the nature of the compound. These modifications are discussed in companion papers. The vulcanizate changes resulting from heat treatment are increased with the concentration of channel black in the original mixture, a fact which is attributed to the increased number of reactive sites, and hence the increased number of polymer-black associations, provided by the black. Heat treatment is effectively carried out at high concentrations of carbon black and the systems may then be diluted by the addition of raw polymer without losing any of the benefits accrued by heat treatment at lower concentrations of black.

Butyl rubber, because of the chemical stability which results from its low unsaturation, is ideally suited for heat treatment processes. The use of modifying agents and high temperatures permits efficient, short-time heat treatment operations and the process is thereby brought in the range of practicality required for commercial utilization.

The heat treatment of natural rubber and GR-S is subject to serious limitations. Oxidative effects compete with the interaction of carbon and polymer and, unless great care is exercised, the quality of the vulcanizate is degraded by the treatment.

ACKNOWLEDGMENT

The author expresses appreciation to J. Rehner, Jr., for valuable assistance in reviewing the manuscript, and to F. P. Baldwin for helpful discussion of the results. Acknowledgment is accorded to R. L. Zapp for data concerning the time-temperature dependence of static heat treatment. Thanks is also given to J. Scarpa for assistance in carrying out the experimental work.

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Compounding Neoprene for Increased Resistance to Water

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MOST commercial neoprene compounds are based on the use of a combination of zinc oxide and magnesium oxide as vulcanizing agents and contain fillers such as carbon black and clay. Such compounds have become standard in the industry because of their good processing characteristics and good balance of vulcanizate properties. Laboratory tests as well as many years of service experience in a variety of applications have shown that such compounds have a degree of water resistance which is entirely adequate for most end uses.

For those applications involving exceptionally severe exposure, greatly increased water resistance can be obtained by giving careful attention to the selection of compounding ingredients. This paper concerns itself with a discussion of compounding and presents data to show the performance of various compounds under a variety of conditions.

Test Procedures

The compounds to be evaluated were mixed on a standard 6 x 12-inch laboratory mill, allowed to age overnight, and then cured in a mold for 20 minutes at 153°C. Immediately on removal from the mold, the slabs were stored in a desiccator over calcium chloride. Duplicate specimens measuring 1 x 1⅞ x 0.080 inches were died out of these slabs, and with a minimum of exposure to the atmosphere, were weighed and placed in 4-ounce bottles filled with distilled water. The bottles were placed in ovens at various temperatures, the caps being screwed tight after temperature equilibrium had been attained. At specified periods, the specimens were removed from the bottles just long enough to determine their increase in weight. For the exposures at 121°C. the specimens were immersed in a pan of water and placed in an autoclave containing steam at 121°C.

Note: This paper was presented before the Division of Rubber Chemistry, American Chemical Society, May 27-29, Boston, Mass.

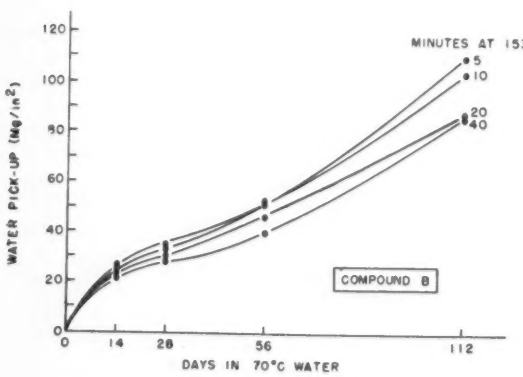

FIG. 1—Effect of cure on water pick-up.

TABLE I—NEOPRENE COMPOUNDS

	A	B	C	D	E
Neoprene Type GN	100	100	100	100	100
Phenyl Beta-naphthylamine	2	2	2	2	2
MPC Carbon Black	20	20	20	20	20
MT Carbon Black	70	70	70	30	30
Hydrated Calcium Silicate (Silene EF)	—	—	—	30	—
Fine Particle Silica (Hi-Sil)	—	—	—	—	25
Light Process Oil	15	15	15	15	15
Stearic Acid	0.75	0.75	0.75	0.75	0.75
Magnesium Oxide	4	—	—	4	4
Zinc Oxide	5	—	—	5	5
Red Lead (Pb_3O_4)	—	20	—	—	—
Litharge (PbO)	—	—	20	—	—
Cure: 20 Minutes at 153° C.					
Tensile Strength, lbs./in.²	2250	2300	2300	1950	2275
Elongation at Break, %	400	400	320	400	440
Hardness, Shore A	67	65	65	70	70

Compounds A, B and C, shown in Table I, were selected as the basis for the major portion of the investigation. These are practical in nature and possess vulcanizate properties which make them suitable for a wide range of applications.

The values shown for the weight increase of the various specimens on immersion in water are expressed in milligrams per square inch of exposed surface, an expression commonly used by the wire and cable industry. This expression of weight increase per unit area was chosen in preference to an expression of volume increase because it is less dependent on the thickness of the test specimens. On the basis of the 1 x 1⅞ x 0.080-inch specimens used for the major part of this investigation, a weight increase of 6 mg/in.² is theoretically equivalent to a volume increase of 1%.

In reporting the weight increase values in terms of mg/in.², no correction was made for extraction since a limited number of tests indicated that, with the exception of stocks containing hydrated calcium silicate and fine particle silica as discussed later in the paper, extraction was essentially negligible. Tests for extraction were made by drying the exposed specimens at 70°C. in a closed desiccator over P_2O_5. This method was found to remove the water without also removing the light process oil which was included in most of the compounds. Specimens containing MgO were heavier after drying than before immersion in water, undoubtedly due to the formation of $Mg(OH)_2$, as explained by Starkweather and Walker *(2)*.

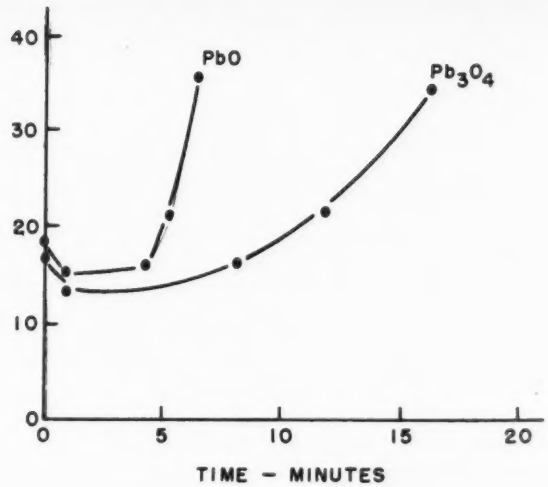

FIG. 2—Mooney scorch—121°C.

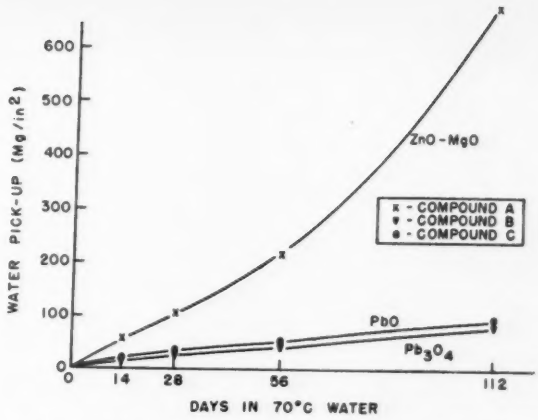

FIG. 3—Effect of vulcanizing agents on water absorption at 70°C.

Data shown in Figure 1 indicate that, except for the stocks which have a decided undercure, the state of cure has only a slight effect on water absorption. Consequently, a cure of 20 minutes at 153°C. was selected for the stocks used in the major portion of this investigation.

Effect of Vulcanizing Agents

The choice of vulcanizing agents has long been known to have a considerable effect on the water resistance of neoprene compounds. Starkweather and Walker *(1, 2)* showed that Neoprene Type E compounds employing PbO (litharge) as the vulcanizing agent absorbed considerably less water than those employing combinations of ZnO and MgO. It has been shown *(1, 3)* that water resistance increases with increasing PbO content, sharply up to 20 parts on 100 parts of neoprene, and only slightly with amounts in excess of 20 parts.

The commercial use of PbO as the vulcanizing agent for Neoprene Types GN and GN-A has been limited somewhat by the tendency for such compounds to scorch unless handled with extra care. Recent studies *(4)* have shown that Pb_3O_4 (red lead), when used in equal amounts as a replacement for PbO as the vulcanizing agent, provides compounds with comparable water resistance, and which have a degree of processing latitude sufficient to permit their use in most factory applications. Figure 2 compares the Mooney scorch curves of compounds cured with Pb_3O_4 and PbO. These curves, obtained at 121°C., show the advantage in processing safety which is obtainable with Pb_3O_4 as the vulcanizing agent. A similar advantage for Pb_3O_4-cured compounds can be shown in storage stability tests consisting of determining the increase in viscosity on storage at 50°C.

Figure 3 shows the effect of vulcanizing agent on water absorption at 70°C. The results obtained with Pb_3O_4 and PbO are similar and both are much superior to the results obtained with the conventional combination of 5 parts of ZnO and 4 parts of MgO. An improvement in the water resistance of compounds vulcanized with ZnO-MgO can be effected by increasing either the amount of ZnO or MgO. Typical results are shown in Figures 4 and 5. The present investigation did not include increased amounts of both oxides in the same compound, but the work of others *(1)* suggests that the results are additive. The use of less than 5 parts of ZnO to reduce rate of cure and less than 4 parts of MgO to increase rate of cure is not uncommon in commercial practice. The results shown in Figures 4 and 5 point out the dangers involved in this practice when water resistance is a consideration.

The use of ZnO in conjunction with Pb_3O_4 has no

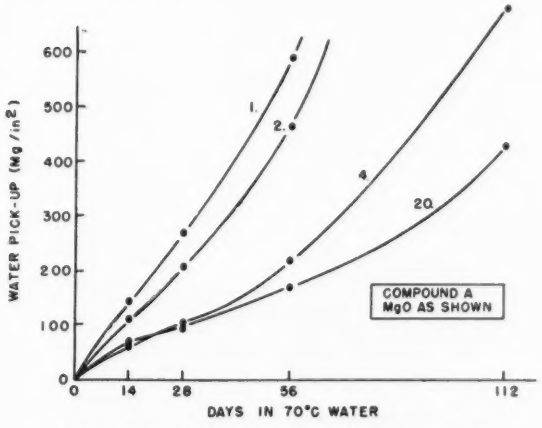

FIG. 4—Effect of varying magnesium oxide.

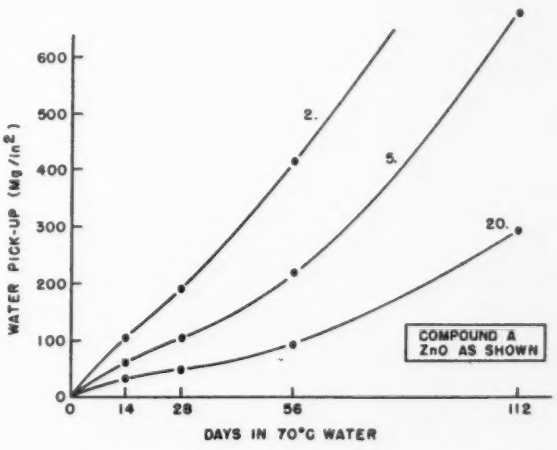

FIG. 5—Effect of varying zinc oxide.

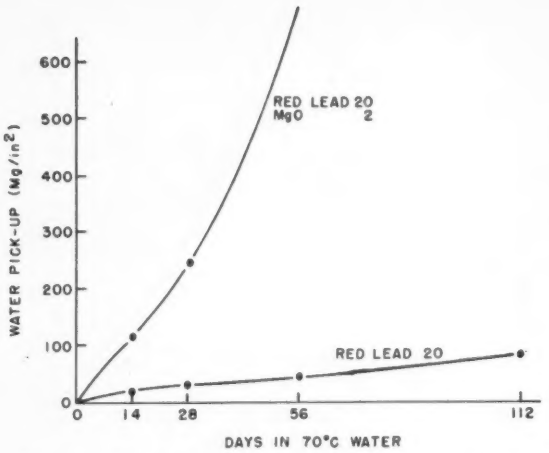

FIG. 6—Effect of magnesium oxide with red lead.

appreciable effect on water resistance under normal conditions, but on long immersions at relatively high temperatures (2 to 4 months at 70°C.) it has somewhat of an adverse effect. On the other hand, the use of MgO in combination with Pb_3O_4 produces compounds with very poor water resistance under all conditions. Figure 6 shows the results obtained when 2 parts of MgO was added to the Pb_3O_4-cured Compound B.

Effect of Fillers

The selection of fillers for water-resistant neoprene compounds is important. Table II lists the results that were obtained when Pb_3O_4-cured compounds containing 25 volumes of a large number of typical fillers were immersed in 70°C. water for various periods of time. As a class, the carbon blacks provide the greatest water resistance but attention should be given to the important differences which exist among the various types. There seems to be no correlation between the particle size of the blacks and the water resistance which they impart, and this suggests that other factors are responsible for the differences noted. Of the non-black fillers, none is superior to hard clay. The various types of whiting imparted especially poor water resistance, and their use should be avoided in compounds designed for water resistance.

A study in a Neoprene Type GN compound, vulcanized with 5 parts of ZnO and 4 parts of MgO, rated the fillers in a similar order with the exception of hydrated calcium silicate (Silene EF) and fine particle silica (Hi-Sil). ZnO-MgO cured compounds containing these fillers differ from all others which have been evaluated in that they tend to reach equilibrium swell. Typical weight increase curves comparing such compounds with conventional compounds based on the use of ZnO-MgO and Pb_3O_4 as vulcanizing agents are shown in Figure 7.

The compounds containing hydrated calcium silicate or fine particle silica show relatively large weight increases during the early stages of immersion, following which they gradually decrease in weight as the immersion time is increased. Other experiments have shown that such stocks continue to decrease slowly in weight even after immersion periods as long as one year at 70°C. At the end of this prolonged exposure, the physical properties, as judged by hand test, are relatively unaffected.

Experiments run at temperatures ranging from 25°C. to 100°C. show that the weight increase curves go through the same maximum value, the only difference being that the time required to reach the maximum decreases with increasing temperature. Approximately 3 months are required at 38°C. as compared with 5 days at 95°C.

While the weight increase curves go through a maximum, there is evidence to indicate true water absorption curves would show an equilibrium condition. This is suggested by the fact that extractions of 44 mg/in.² for the hydrated calcium silicate stock (Compound D) and 32 mg/in.² for the fine particle silica stock (Compound E) were obtained on specimens which had been in 70°C. water for 300 days, using the drying technique

TABLE II—EFFECT OF FILLERS ON WATER RESISTANCE

Test Recipe	
Neoprene Type GN	100.00
Phenyl Beta-naphthylamine	2.00
Light Process Oil	15.00
Stearic Acid	0.75
Pb_3O_4	20.00
Filler	25 vol.

Filler (25 vol.)	Weight Increase (mg./in.²) after Immersion in 70° C. Water		
	7 Days	28 Days	112 Days
None	44	99	263
CC Carbon Black	21	36	142
HPC Carbon Black	19	35	113
MPC Carbon Black	19	39	139
EPC Carbon Black	17	35	136
SAF Carbon Black	28	53	117
FF Carbon Black	38	81	191
HMF Carbon Black	43	94	233
MAF Carbon Black	24	46	92
SRF Carbon Black	54	112	267
FT Carbon Black	26	54	121
MT Carbon Black	29	58	122
Acetylene Carbon Black	23	44	86
Hard Clay	38	76	180
Fine Particle Natural Whiting	138	560	2902
Fine Particle Precipitated Whiting	92	284	1241
Ground Limestone	105	450	4030
Barytes	43	94	230
Talc	42	151	942
Lithopone	50	105	278
Hydrated Calcium Silicate (Silene EF)	296	478	390
Fine Particle Silica (Hi-Sil)	107	228	144
Titanium Dioxide	28	62	192
Zinc Oxide	31	71	181

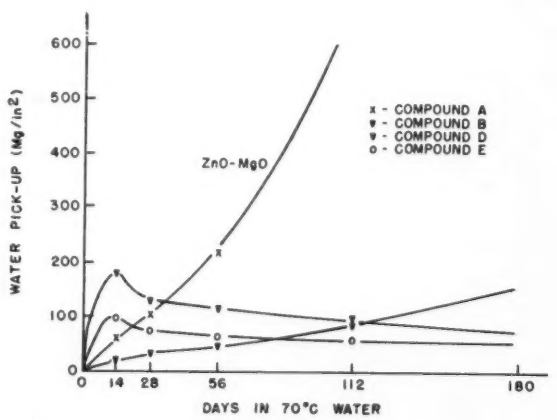

FIG. 7—Effect of hydrated calcium silicate and fine particle silica.

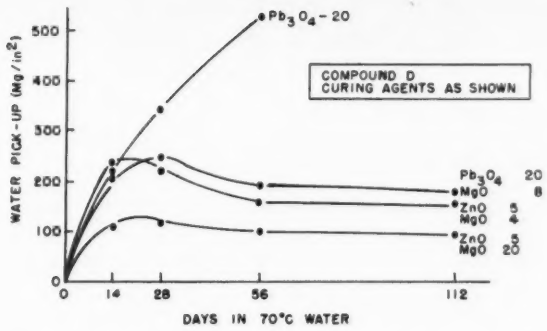

FIG. 8—Effect of curing agents on stocks containing hydrated calcium silicate.

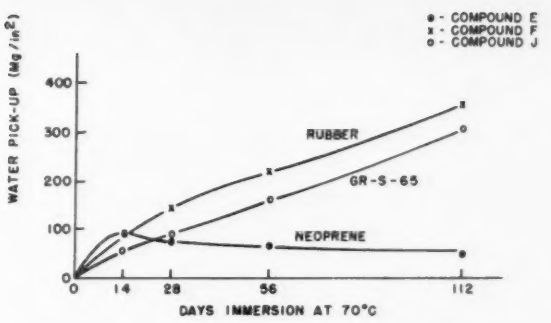

FIG. 9—Effect of fine particle silica in neoprene, natural rubber and GR-S-65.

previously described. A sufficient number of tests have been carried out to indicate that equilibrium swell is always obtained with these fillers in neoprene stocks vulcanized with ZnO and MgO. No attempt has been made to determine the required quantity of these pigments but it has been established that 20 parts on the neoprene is sufficient for equilibrium swell.

The choice of vulcanizing agents for neoprene compounds containing hydrated calcium silicate has considerable effect on their behavior in water. Figure 8 shows the results obtained when the ZnO-MgO in Compound D were replaced by various combinations of metallic oxides. The results suggest that MgO plays an important part in bringing about equilibrium water absorption. It is particularly noteworthy that the stock vulcanized with Pb_3O_4 absorbed a large amount of water and did not reach equilibrium swell. Similar experiments were not run on stocks containing fine particle silica but the results would probably parallel those shown for hydrated calcium silicate.

Figure 9 shows the comparison of the effects of fine particle silica in neoprene, natural rubber and GR-S (for this test GR-S-65, the type recommended for low water absorption, was selected). Neither the rubber nor the GR-S-65 stocks shows any indication of reaching an equilibrium weight. Perhaps the addition of MgO to these compounds would cause them to behave in the same manner as the neoprene compound.

Effect of Softeners

The selection of softeners for water-resistant neoprene compounds is not as critical as the selection of fillers. Table IV, which lists the results obtained when Pb_3O_4-cured compounds containing a number of typical softeners were immersed in 70°C. water for various periods of time, shows that with the exception of factice and one of the ester type plasticizers, the choice of softener had little effect on water resistance.

Effect of Type of Neoprene

The general-purpose neoprenes, Types GN, W, WRT and GRT, were found to behave similarly in water when tested at temperatures ranging from 25°C. to 121°C. The comparison was made in Compound B, containing Pb_3O_4 as the vulcanizing agent. In order to obtain equivalent states of cure, 0.5 part of 2-mercaptoimidazoline (NA-

TABLE III—RUBBER AND GR-S COMPOUNDS

	F	G	H	I	J
Smoked Sheets	100.0	100.0	—	—	—
GR-S	—	—	100.0	—	—
GR-S-65	—	—	—	100.0	100.0
Peptizing Agent	0.3	0.3	1.0	1.0	1.0
Phenyl Beta-naphthylamine	2.0	2.0	2.0	2.0	2.0
MPC Carbon Black	27.0	25.0	25.0	25.0	27.0
MT Carbon Black	40.0	95.0	95.0	95.0	40.0
Fine Particle Silica (Hi-Sil)	33.0	—	—	—	33.0
Light Process Oil	20.0	20.0	20.0	20.0	20.0
Stearic Acid	1.0	1.0	—	—	—
Zinc Oxide	5.0	—	5.0	5.0	5.0
PbO	—	5.0	—	—	—
Zinc Salt of Mercapto-benzothiazole	1.5	—	—	—	1.5
Benzothiazyl Disulfide	—	1.5	—	—	—
Tetramethylthiuram Monosulfide	0.15	0.1	0.5	0.5	0.5
Sulfur	2.5	1.5	2.0	2.0	2.0
Cure: 20 Minutes at 153° C.					
Tensile Strength, lbs./in.²	2000	2325	1575	1550	1650
Elongation at Break, %	500	400	300	280	460
Hardness, Shore A	62	62	60	60	60

TABLE IV—EFFECT OF SOFTENERS ON WATER RESISTANCE

Test Recipe

Neoprene Type GN	100.00
Phenyl Beta-Naphthylamine	2.00
Stearic Acid	0.75
MPC Carbon Black	20.00
MT Carbon Black	70.00
Pb_3O_4	20.00
Softener	15 vol.

Softener (15 vol.)	Weight Increase (mg./in.²) after Immersion in 70° C. Water 7 Days	28 Days	112 Days
None	15	30	83
Light Process Oil	15	33	96
Coumarone-indene Resin	16	34	115
Carbonex S	15	31	91
Factice	25	87	339
Para Flux	16	36	100
Plasticizer SC	20	57	165
TP-90B	15	40	123
Trioctyl Phosphate	19	38	113
BRT No. 7	16	32	106
Smoked Sheets	14	28	92
GR-S-65	13	26	79
High Styrene Copolymer	16	31	88

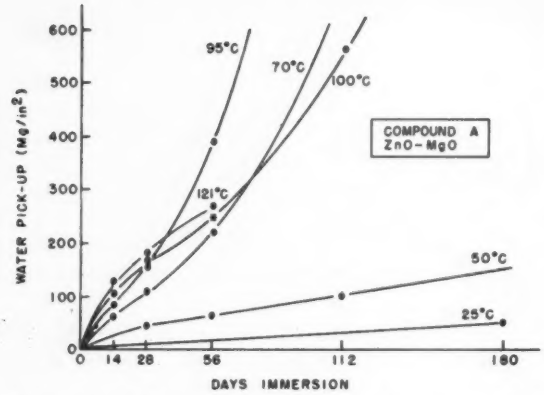

FIG. 10—Effect of temperature on the zinc oxide-magnesium oxide-cured stock.

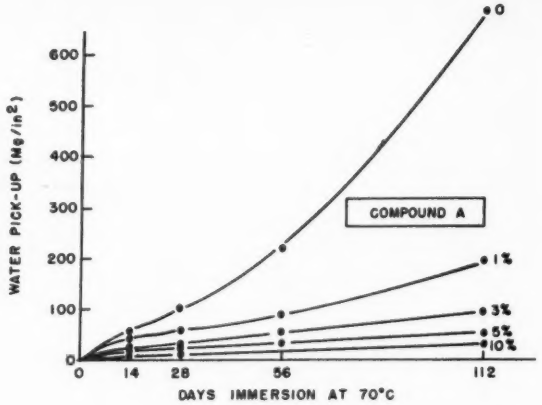

FIG. 12—Effect of immersion in NaCl solutions.

22) was added to the compound containing Type W and 0.75 part to the compound containing Type WRT. The use of these latter two neoprenes makes possible the development of light colored stocks having a very low water absorption. However, their commercial utility has been limited by the fact that processing difficulties are frequently encountered when they contain sufficient accelerator to have an adequate rate of cure at normal curing temperatures.

Effect of Temperature

The results obtained with the ZnO-MgO-cured Compound A and the Pb_3O_4-cured Compound B, as a result of immersion in water at temperatures ranging from 25°C. to 121°C., are shown in Figures 10 and 11. While the rates of water pick-up during the shorter immersions increase with temperature, the results obtained on longer immersions are surprising. With both curing systems, maximum water absorption occurs at about 95°C. At above this temperature the rate of water pick-up decreases sharply somewhere between 7 and 28 days, and after 56 days, in the case of the ZnO-MgO-cured stock, the total water pick-up at 100°C. is less than at 70°C., while the same condition occurs after 180 days in the case of the Pb_3O_4-cured stock.

The tests at 121°C. were discontinued after 56 days' immersion but there is indication from the shape of the curves that the eventual pick-up at this temperature will be less than at 100°C. A limited number of tests indicate that similar results are obtained with both GR-S and GR-S-65, except that the temperature at which the rate decreases is somewhat lower. Natural rubber stocks did not exhibit this phenomenon.

It is apparent from the curves shown in Figures 10 and 11 that the choice of Pb_3O_4 as the curing agent for neoprene stocks in preference to ZnO-MgO results in superior water resistance over the entire temperature range of 25°C. to 121°C.

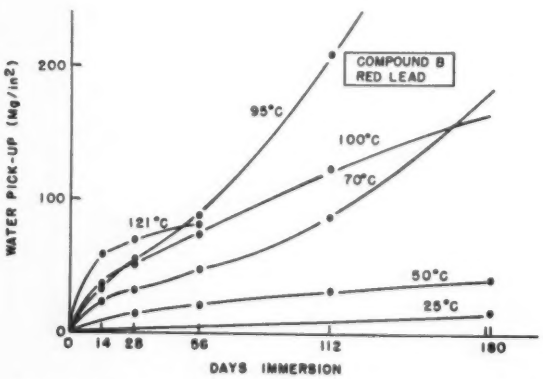

FIG. 11—Effect of temperature on the red lead-cured stock.

Immersion in Solutions

Neoprene compounds absorb less water from aqueous solutions than from distilled water, and the absorption decreases as the strength of the solution is increased. Figure 12 shows the absorption by a ZnO-MgO-cured stock (Compound A) on immersion in NaCl solutions, ranging from 1 to 10% in concentration. Table V lists the results obtained with solutions of NaCl, HCl and NaOH and it is evident that, as in the case of distilled water, the Pb_3O_4-cured compounds are superior to the compounds cured with ZnO-MgO. The high absorption by the ZnO-MgO stock from solutions of HCl are probably due to a reaction with the MgO and ZnO to form the chlorides.

Comparison with Rubber and GR-S

Comparison was made among the water absorption values of neoprene, GR-S, GR-S-65 and natural rubber

(Continued on Page 84)

TABLE V—EFFECT OF SOLUTIONS ON NEOPRENE COMPOUNDS

	Weight Increase (mg./in.²) in 70° C. Solutions					
	ZnO-MgO (Compound A)			Pb_3O_4 (Compound B)		
Days	7	28	112	7	28	112
Distilled H_2O.	39	103	686	16	31	86
NaCl, 1%....	29	60	193	11	17	24
NaCl, 3%....	21	34	90	5	5	1
NaCl, 5%....	16	23	49	3	3	1
NaCl, 10%...	12	13	27	1	0	1
NaOH, 1%...	32	62	180	18	34	50
NaOH, 5%...	14	26	53	0	4	35
HCl, 1%.....	76	114	243	15	24	33
HCl, 5%.....	90	189	319	15	22	31

Use of Synthetic Rubber in Truck Tires

By I. J. SJOTHUN* and P. S. GREER

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NATURAL and synthetic rubbers are indispensable to the domestic economy of the United States and are vital to the national defense. Natural rubber must be imported to meet the domestic demand, and its source can be largely cut off by enemy control of southeast Asia, as in World War II. Both types of rubber have specific uses in which one is clearly superior to the other. However, there is a large section of the rubber industry in which the two materials are relatively interchangeable. Since almost 70% of the total rubber consumption of the United States is in tires, which utilize both materials, synthetic rubber is a formidable bulwark against the collapse of our national transportation system in the event of an all-out war.

The consumption of new rubber during 1952 *(7)* amounted to 1,261,000 long tons, of which 454,000 long tons or 36% was natural rubber (Fig. 1). Sixty-seven per cent of the total natural rubber was consumed by transportation items. Forty-two per cent of the total natural rubber consumed, or 63% of the natural rubber used in transportation items, went into truck tires. The small percentage of natural rubber consumed elsewhere reflects the advantages of synthetic rubber in passenger and farm tires where satisfactory and even superior service is obtained from tires made almost wholly from synthetic rubber. Truck tires, thus, present the major opportunity for further savings in natural rubber in the event of a national emergency. In the interest of national security a full investigation of the possible substitution of domestically-produced rubber in truck tires is dictated by the magnitude of the requirement and the essentiality of the end use.

Factors Involved in Test Program

Commercial highway tires operate at high speeds often under considerable overload and therefore develop high operating temperatures which are accentuated by the use of synthetic rubber. To date, satisfactory large truck tires (10.00 and above) have been made commercially only with relatively small proportions of synthetic rubber. However, a number of test programs have been carried out in an effort to utilize substantial proportions of synthetic rubber in these tires. To characterize this truck tire problem, it was considered worth while to summarize some of these test results on synthetic truck tires obtained by the Government Tire Test Fleet. The tests were conducted on roads in the San Antonio, Texas, area. The term "synthetic tires" as used herein refers to tires containing 10% synthetic rubber or more; the term "synthetic rubber" refers to either cold or hot GR-S if used in the body but to cold rubber only if used in the tread, unless otherwise indicated.

Synthetic rubber is superior to natural rubber for tread-wear and tread-crack resistance in passenger, farm service and small truck tires (7.50 and smaller). Synthetic and natural rubber give equal performance in the bodies of these tires and the relative use of each is determined mainly by the prevailing supply and economic situations. Considerable data have been reported in the technical literature on the road abrasion resistance of tread compounds made with synthetic rubber *(1, 4, 5, 6, 9, 10, 11, 13)*, particularly on passenger car tires. Some data are reported on synthetic passenger car tire carcass performance *(9, 12)*. Little is reported on the effect of synthetic rubber on truck tire performance *(6, 8, 11, 12)*.

Cold rubber tread compounds are adequate for tread-wear resistance but the over-all adequacy of the tread for large truck tires is debatable and is affected by the carcass beneath as will be shown later. The adequacy of the tread is affected by the synthetic content of the tire, and the adequacy of the tire at a given synthetic level perhaps is influenced by the placement of the synthetic rubber in the tire.

A number of projects have been tested at the Government Tire Test Fleet to appraise the over-all per-

A Note from the Editor...

Ever since synthetic rubber came into the picture as a wartime necessity, the question of its use under normal circumstances has been paramount. Today, with all emergency controls released, the use of natural or synthetic rubber in tires, which still represents major consumption, is dictated by terms of economy and technological advantages. These factors will increase in importance from now on, unless another emergency period confronts us.

With this issue we begin the publication of three articles devoted to the use of synthetic rubber in tires. The evaluations contained in these articles are based on projects undertaken by the Government Tire Test Fleet and on new and improved measurement techniques developed by the Government Laboratories at the University of Akron. The first of these articles, which is published herewith, is devoted to the use of synthetic rubber in truck tires, and indicates that large truck tires have been developed containing 30% synthetic rubber which approach natural rubber tires in performance. The second article covers the use of synthetic rubber in passenger car tires, and indicates that cold rubber outperforms natural rubber in passenger car tire treads. The third article appropriately describes the new testing equipment which makes possible more precise tire temperature data.

We are pleased to be able to bring our readers the most up-to-date data on so vital a topic, since decisions affecting the use of either natural or synthetic rubber face every rubber manufacturer in the United States.

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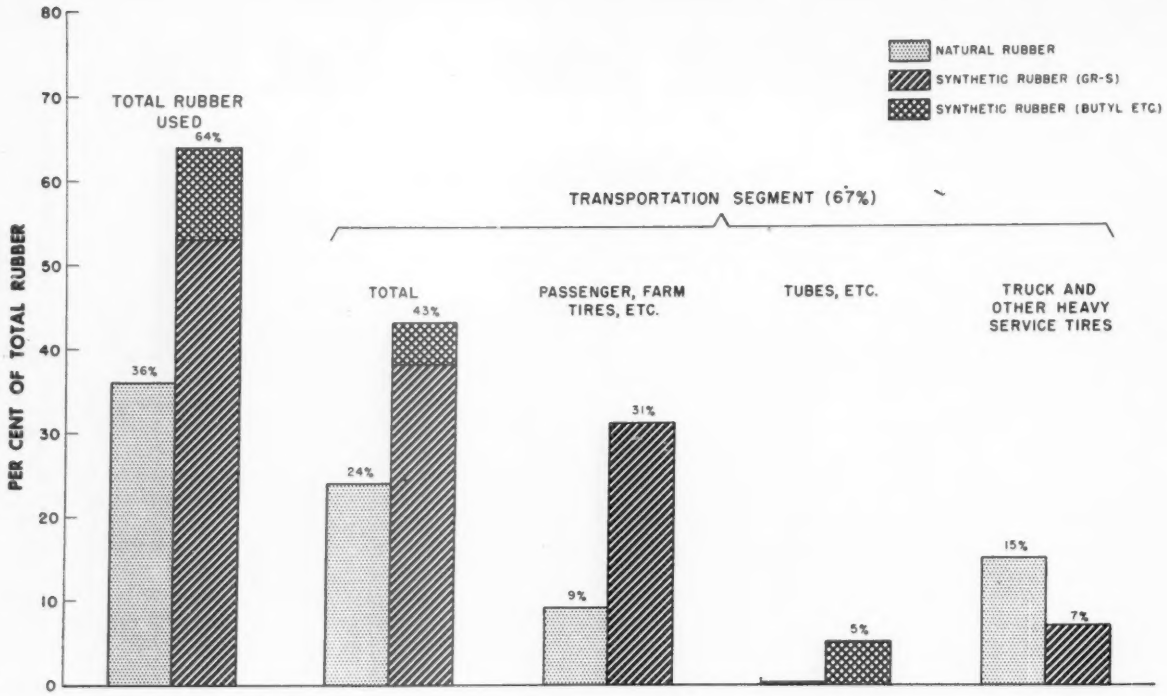

FIG. 1—Consumption of rubber in the United States: 1952.

formance of truck tires at several synthetic rubber levels. One set of projects consisted of groups of 11.00-20, 12-ply rating highway tires from four companies run at 45% overload, 45 mph, on 100% pavement during the summer months. These groups of tires contained 0, 30, 50 or 68% synthetic rubber. The 30% synthetic tires had synthetic-natural rubber blends in the treads and natural rubber in the bodies. The 50% synthetic tires had varied constructions such as synthetic rubber, natural rubber or blends in the treads with appropriate sidewall and body compounds and constructions to meet the requirement on synthetic rubber content. The 68% synthetic tires either had synthetic rubber or blends in the treads, again with appropriate sidewall and body compounds and constructions to meet the requirement on synthetic rubber content. The choice of polymer and its distribution within the tire were left to the manufacturer's judgment to provide tires of maximum serviceability for highway operation. Other groups at higher synthetic rubber levels in the same tire size had been run previously. This over-all program was designed to obtain tire performance background under today's severe commercial operating conditions and to establish numerical performance ratings for tires at the various synthetic rubber levels.

FIG. 2—Typical test truck.

The above tires were tested on WC 22 White trucks equipped with dual wheels (Fig. 2). The test tires were mounted on the inside dual position. Smaller safety tires, which ride without touching the road surface except in case of tire failure, were mounted in the outside positions. The use of a single test tire on each side in place of the conventional duals, doubles the torque applied to the test tire at any given truck load. This method of operation permits the required tire overloads to be carried with a moderate truck load. Since the trucks were not overloaded, a speed of 45 mph was maintained at all times, even on hills and curves. Gravel was used as ballast and was loaded in specially constructed partitioned boxes in such a manner that the load was accurately adjusted and maintained.

The test conditions were so established that the natural rubber control tires failed prior to wearing out (at a group average of 31,057 miles), and the high synthetic tires still ran to suitable mileages to establish performance levels. These test conditions brought out the hysteresis and cohesive characteristics of the various tires as measured by temperature rise and carcass durability. Since all tires were run to failure, it was possible to rate the various groups of tires from each participant for carcass durability from the average mileage of tires in each group removed due to legitimate failures; legitimate failures are attributable to tire weakness rather than to injury, defect or voluntary removal. Mileages of tires failing from injuries or defects were included only when the average group ratings were supported or improved thereby. The over-all rating for each synthetic level was obtained by averaging the various company ratings.

(This is equivalent to prorating all mileages to a standard control mileage, gives equal weight to each participant, and does not give undue weight to tires which perchance ran to high mileage.)

Carcass Durability Ratings

The average ratings obtained at the various synthetic levels (Fig. 3) illustrate that there is a definite drop in carcass durability with increasing synthetic content. The drop in carcass durability is somewhat accentuated by the fact that 55% of the natural rubber control tires and only 21% of the synthetic tires were still running when it became necessary to change temporarily to a less severe test route, due to the wash-out of bridges, and the average ambient temperature dropped appreciably. The carcass durability ratings together with other tire test results for this one set of 11.00-20 tires are shown in Table I.

When a small percentage of synthetic rubber is introduced into a tire the synthetic rubber usually is placed in the sidewall, or in both tread and sidewall where they are one-piece. On the average the sidewall requires about 15 to 20% of the hydrocarbon in the truck tire. Since the sidewall has little effect upon the operating temperature of the tire, it is likely that the major drop in performance of the 30% synthetic group was caused by the synthetic rubber which was placed in the tread. Figure 3 therefore shows only a slight drop in carcass durability to 10% synthetic content and only a 15% drop to 30% synthetic content. Beyond the range of 30% the rapid decrease in carcass durability appears to be a linear function of synthetic content.

Of the 50% synthetic tires, the group with natural rubber treads failed at the highest average mileage. Their control tires also failed at the highest average mileage so that the carcass durability rating was in line with the 50% synthetic tires from other participants. The carcass durability rating of the group of 50% synthetic tires with synthetic rubber treads was 61 compared with the average group rating of 65. The carcass durability rating of 61, however, indicates that 11.00-20 tires with synthetic treads are deficient for performance under these severe testing conditions. The average group rating of 65 also indicates that tire performance was not materially enhanced by changes in rubber placement.

TABLE I—CARCASS DURABILITY AND TREAD-WEAR RATINGS AND OTHER TIRE TEST RESULTS (11.00-20 TIRES).

	% Synthetic Rubber			
	0	30	50	68
Carcass Durability Rating	100	85	65	47
Tread-wear Rating *	100	92	103	106
% Section Growth	2.56	2.76	2.85	3.40
% Outside Diameter Growth	1.13	1.31	1.27	1.48
Average Inches of Tread Cracking At Approx. 12,000 Miles	8	3	2	5
Average Tread Hardness (Shore)				
Original	56	54	56	56
Final	55	55	58	60
Temperature Rise °F.				
Tread Base	0	11	10	16
Contained Air °F.	0	6	11	14
Tire Failures—%				
Body Breaks	36	50	36	22
Ply Separations	5	0	0	22
Tread Separations	18	42	22	22
Tread-Crack Separations	5	0	14	34
Miscellaneous	36	8	28	0

* Obtained by dividing skid loss of control tire group by skid loss of experimental group. Skid loss was measured with a depth gauge.

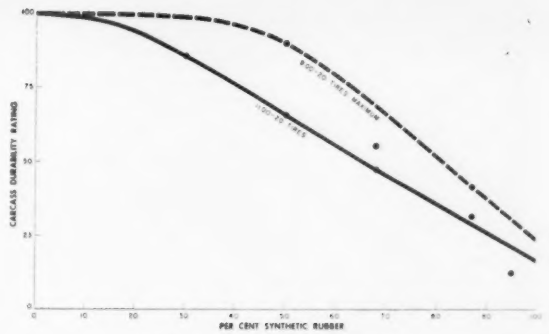

FIG. 3—Carcass durability.

9.00-20, 10-ply rating tires have been run under similar percentages of overload during the summer months but the route contained 8% gravel for the first 7,000 miles. The results are less reliable, however, since the comparative data are limited, the groups were varied and the projects run at different times during the summer, the tires contained experimental polymers and compounds, and about one-half the natural rubber control tires of each project were removed without failure. Therefore, the results on these tests necessarily represent maximum possible ratings for the synthetic tires rather than actual ratings, as it is reasonable to assume that the natural rubber control tires would have run to a higher average final mileage.

The 9.00-20 data have been incorporated into Fig. 3. These results are perhaps more favorable than the results of the 11.00-20 tires. The 9.00-20 tires, all of which had synthetic treads and are estimated to contain 50% synthetic rubber, have a maximum carcass durability rating of 89, which is higher than the true value. The corresponding 87% synthetic tires have a maximum carcass durability rating of 41 on the same basis. However, the over-all trend confirms the general pattern of the 11.00-20 tires and consequently the less reliable 9.00-20 results are omitted from further discussion of carcass durability.

Hysteresis and Cohesive Properties

To obtain a better understanding of the hysteresis and cohesive properties of the various tires at the several synthetic rubber levels, tread base, contained air and atmospheric temperature readings were obtained daily at about 3:30 P.M. for the first ten consecutive days of test on each tire at the end of the day shift. A speed of 45 mph was maintained for a distance of 50 miles immediately preceding temperature measurements.

Tread base temperatures were taken by injecting a thermocouple needle (Fig. 4a) into the shoulder rib, normal to the tread surface, to a depth of 1.05-inch to a point just above the outside plies or breakers (Fig. 4). Contained air temperatures were obtained by using a standard replacement valve and thermocouple adapter with a thermocouple length of 13¼ inches from the grommet to the thermocouple junction (Fig. 5).

A word of explanation on tread base temperatures is called for at this point. As stated, an injection type thermocouple is used by the Government Tire Test Fleet to obtain tread temperatures. The highest reading of two injections is taken as the tread temperature; however, if the readings differ by more than 5°F., a third measurement is taken and the highest reading recorded. Con-

FIG. 4—Temperature measurements.

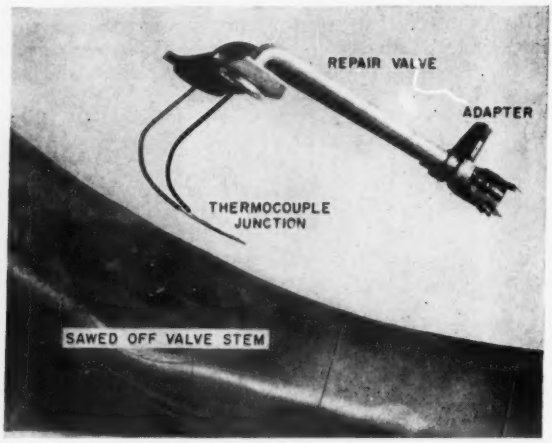

FIG. 5—Contained air temperature set-up.

tained air temperatures are taken simultaneously. Temperature readings are normally completed within one minute after the truck comes to a stop.

The injection thermocouple used in these tests is a simple device. The thermocouple is soldered into the point of the needle. The needle is set to a predetermined depth which is easily controlled and adjusted by a collar with thumb screw. The needle is completely insulated from the plunger and the barrel of the gun.

In the contained air temperature test, the thermocouple is inserted through the assembled adapter and repair valve (see Fig. 5) and is then straightened. The original valve stem is sawed off and the thermocouple correctly positioned within the inner tube.

The temperature data for the natural rubber tires varied with make of tire. Comparisons are based, therefore, on the increase in temperature over that of the respective natural rubber control (Fig. 6). The increases in synthetic content were accompanied by rather uniform increases in contained air temperatures and by somewhat erratic increases in tread temperatures. The increase in temperature over the natural rubber control averaged only 15° F. for the 68% synthetic construction. There were indications that the higher synthetic tread base temperatures were not necessarily reflected in correspondingly higher contained air temperatures of natural rubber carcasses (0% vs. 30% synthetic groups) and, conversely, higher contained air temperatures obtained with synthetic carcasses were not reflected in a corresponding increase in tread base temperatures (30% vs. 50% synthetic groups). The apparent discrepancies, therefore, may be partially attributable to the difference in placement of the natural and synthetic rubber in various groups and the fact that fewer manufacturers were represented in the 30% and 68% synthetic rubber groups.

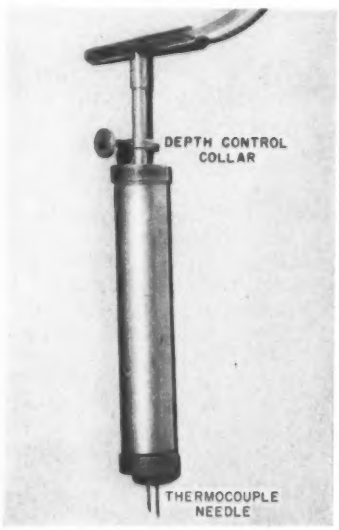

FIG. 4a—Injection thermocouple.

Efficiency Ratings of Rubbers

To determine the relative number of miles to be obtained from a given quantity of natural rubber, termed for convenience the "natural rubber use efficiency," the carcass durability ratings were divided by the per cent natural rubber in the tire; thus, if synthetic rubber were equal to natural rubber for tire performance then twice as many miles would be obtained from a given quantity of natural rubber in 50% synthetic tires than in natural rubber tires and three times as many miles in 67% synthetic tires and five times as many miles in 80% synthetic tires. The natural rubber use efficiency ratings at these levels would be 200, 300, and 500 respectively (Fig. 7).

The natural rubber use efficiency ratings obtained from test at the several synthetic rubber levels (Fig. 7) show that there is a gradual drop-off in efficiency with increased synthetic rubber content as compared with the theoretical which assumes synthetic rubber equal to natural rubber for tire performance. The natural rubber use efficiency rating increased rapidly to about 30% but beyond that point there was little improvement.

In the event of an all-out war, butadiene, styrene and other chemicals necessary to the production of synthetic rubber would undoubtedly be in short supply. Under such conditions it would be also necessary to obtain the most efficient use of the synthetic rubber. The relative miles obtained from a given quantity of synthetic rubber over and above that attributable to the natural rubber component based on natural rubber as par (100) is for convenience termed the "synthetic rubber use efficiency" and is calculated by subtracting the natural rubber

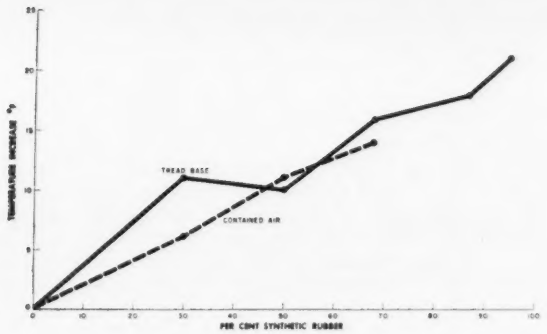

FIG. 6—Increase in tire temperature (11.00-20 tires).

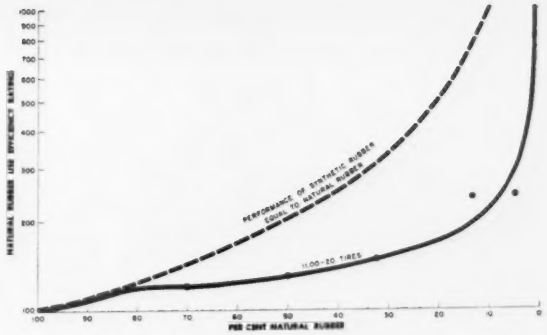

FIG. 7—Natural rubber use efficiency.

equivalent from the carcass durability rating and dividing the difference by the per cent synthetic rubber in the tire group. For example, the 70% natural rubber tires had a carcass durability rating of 85. Seventy percentage points of this rating can be assumed to be attributable to the natural rubber component. Then fifteen percentage points were attributable to the synthetic rubber component. Since this group of tires contained 30% synthetic rubber, the synthetic rubber use efficiency rating is 15/30 (100) or 50 as compared with natural rubber at 100.

Figure 8 shows that the synthetic rubber use efficiency drops off sharply with increasing synthetic content and that the additional mileage obtained from the synthetic content is relatively low. However, if natural rubber was in extremely short supply and was the only consideration, then high synthetic tires would provide the greatest number of tire miles from a given quantity of natural rubber, even though in tires of 50% synthetic, or above, comparatively little value would be derived from the synthetic rubber component.

Under less drastic conditions of natural and synthetic rubber supply, the economics of the synthetic level of tire construction must be considered in addition to the natural and synthetic rubber use efficiencies. The relative cost per tire mile for two levels of synthetic tire cost is shown in Fig. 9. These figures again are based on the 11.00-20, 12-ply rating tires and the corresponding carcass durability ratings (Fig. 3). This figure shows that at equal tire cost the relative cost per tire mile for a 30% synthetic tire is only 18% higher than for the natural rubber tire but above that point the relative cost per tire mile increases rapidly. The cost per tire mile for a 68% synthetic tire is more than double. The higher relative cost per tire mile would also be aggravated by the increased number of road delays.

This program on 11.00-20 tires was run during the summer and the tread-wear ratings of the synthetic tire groups were at least equal to those of natural rubber controls except in the 30% synthetic group. In this case the treads were composed of synthetic-natural rubber blends. In tires of higher synthetic content, synthetic treads invariably gave better tread-wear resistance than treads of synthetic-natural rubber blends. Similar data on 9.00-20 and other 11.00-20 tires with cold rubber treads run during the summer, though perhaps less reliable for reasons stated earlier, confirm these results (see Table II).

Synthetic treads on truck tires, as with passenger tires, give relatively better tread-wear performance during the heat of the summer than the cool of the winter. The average results of 15 comparative truck tests (chiefly in the 9.00-20 size) are shown in Table III.

These data indicate that compared with natural rubber treads, synthetic treads wear 23% better in the summer than they do in the winter. Since a number of the synthetic treads in Table III were made from 122°F. polymers, it further confirms that the superior cold rubber treads are adequate for tread-wear resistance.

Effect of Testing Season

The effect of testing season on the relative tread-wear performance has been apparent since the early stages of the synthetic rubber program. It does not appear to be recorded in the technical literature of that period, however. Mandel, Steel and Stiehler *(6, 11)* recently reported that natural rubber treads wear faster in the

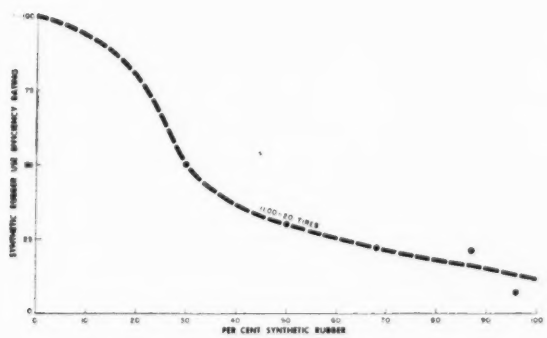

FIG. 8—Synthetic rubber use efficiency.

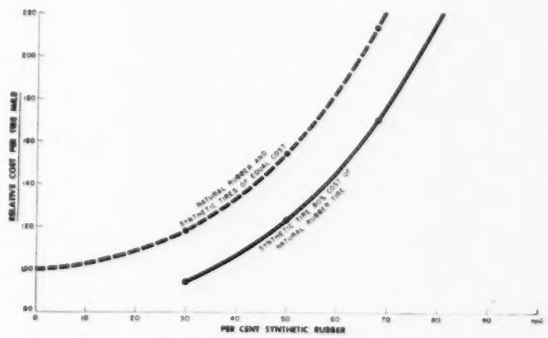
NATURAL RUBBER AND SYNTHETIC TIRES OF EQUAL COST
SYNTHETIC TIRE WITH COST OF NATURAL RUBBER TIRE
PER CENT SYNTHETIC RUBBER

FIG. 9—Relative cost per tire mile (11.00-20 tires).

TABLE II—DATA ON TREAD-WEAR RESISTANCE.

% Synthetic Rubber	Tread-wear Rating 11.00-20	9.00-20
0	100	100
30	92	105
50	103	114
68	106	110
87	101	106

summer than in the winter while synthetic rubber treads wear faster in the winter than in the summer. Biard and Svetlik *(2)* reported shortly thereafter that synthetic and natural rubber treads are about equal for resistance to abrasion under mild conditions of testing but that synthetic rubber treads are vastly superior under severe conditions.

In truck tires tested at the Government Tire Test Fleet, as the synthetic rubber content (Table I) or the severity of testing increases, tire growth tends to become greater. Increased tire growth also tends to increase tread cracking and/or cut growth. Synthetic rubber treads generally are better for resistance to crack initiation but are poorer for resistance to crack and/or cut growth when compared with natural rubber treads *(3, 10)*. Natural rubber treads often develop numerous small cracks while synthetic rubber treads usually develop much fewer but more severe tread cracks. Synthetic treads also develop higher operating temperatures (Table III). As a result, a large percentage of tires tends to fail from tread-crack separations (Table I). Synthetic treads, therefore, are deficient for over-all performance on most truck sizes in the summer time and possibly on the larger truck sizes in the winter time, particularly if the tire body also contains synthetic rubber. Treads which are adequate on natural rubber bodies may be inadequate on synthetic rubber bodies (30% vs. 50% synthetic groups). Tread-crack separations appear to be one of the prime causes of synthetic tire removal both in the summer and the winter.

Under test conditions used by the Government Tire Test Fleet, natural rubber tires will normally fail before wearing to the fabric, while synthetic tires normally fail at progressively lower mileages. The severity of the test conditions is indicated by the fact that 86% of the 9.00-20 tires tested in the summer and 58% of those tested in the winter failed from legitimate failures, in spite of the fact that 65% of the projects included tread features only and were therefore removed when an adequate tread-wear and tread-crack story had been obtained. With 11.00-20 tires a similar distribution of mileages was obtained, but essentially all tires failed irrespective of testing season.

The data in Table I show that the tread and contained air temperatures of the 68% synthetic rubber 11.00-20 tires were 16°F. and 14° F. higher, respectively, than the natural rubber controls. On the other hand, natural and synthetic rubber treads ran 47°F. and 54°F. hotter, respectively, in the summer than in the winter. The average ambient temperature at the time of tire temperature measurements was only 27°F. higher. The increased tire temperature in the summer operation is no doubt due to the greater summer differential of road surface temperature over ambient temperature. Testing season, therefore, appears to have a far greater effect upon the tire operating temperature than the difference between natural rubber and synthetic rubber treads.

Tire temperature alone does not appear to determine tire life. The natural rubber tires have a summer operating temperature (Table III) of 189°F. while the synthetic tires have a winter operating temperature of 148° F., or 41°F. lower. The relative tire life of the synthetic tire was not increased proportionately from summer to winter.

Considering 9.00-20 tires of 68% synthetic rubber content or less run at the Government Tire Test Fleet in the summer time, 74% failed from separations, 3% from body breaks, and 10% from tread-crack failures. In the winter time only 19% failed from separations, 24% from body breaks and 4% from tread-crack failures. The remaining tires either failed from injuries, were defective or were discontinued. Most natural rubber tires run during the same period were removed without failure. These figures may not be representative of tires produced in volume at these synthetic rubber levels since many of these tires contained either experimental polymers or compounds.

Of the 50% and 68% synthetic 11.00-20 tires run in the summer time, and referred to above, 29% failed from separations, 32% from body breaks and 19% from tread-crack failures. Of the 0% and 30% synthetic tires, 31% failed from separations, 41% from body breaks and only 3% from tread-crack failures in spite of the higher mileage. Synthetic tires, therefore, appear to be deficient in cohesion at the tire operating temperature, or in adhesion between the various component parts of the tire.

Variations in Tread Hardness

Tread hardness no doubt also has an important effect on tread performance. On most tests run at the Government Tire Test Fleet, the original tread hardness of the natural and synthetic rubber treads has been in the same range. However, as testing progressed the synthetic rubber treads usually became harder while the natural rubber treads generally became softer, as indicated by Table I. Normally, the difference has been more pronounced. The increase in hardness of the synthetic treads probably affects the tread-wear beneficially and tread-cracking adversely.

Under less severe conditions of operation such as might be imposed in the event of a national emergency, synthetic tires will run to considerably higher mileages, but it is anticipated that, including potential recapping, the relative ratio of miles to be obtained from tires of various synthetic contents will remain fairly constant.

Many states prohibit loads on a single axle in excess of 18,000 pounds. For a truck with 11.00-20 dual tires the 18,000 pound maximum axle load would permit only the rated recommended Tire and Rim Association load of 4,500 pounds on the tires. This same axle load on 9.00-20 dual tires would give a tire overload of 33%. Thus, within the legal load and speed limits of the various states, synthetic tires can be expected to perform

TABLE III—AVERAGE RESULTS OF 15 COMPARATIVE TRUCK TESTS (CHIEFLY IN THE 9.00-20 SIZE).

	Summer	Winter
Tread-wear Rating		
Natural rubber tread	100	100
Synthetic rubber tread	112	91
Ambient Temperature °F.	91	64
Tread Base Temperature °F.		
Natural rubber tread	189	142
Synthetic rubber tread	202	148

slightly better than shown by Figures 3, 7, and 8 and certainly to run to higher mileages.

Increasing the synthetic level in large truck tires apparently requires more than an improvement in hysteresis by polymer, compounding or construction changes. Improvements also appear to be required in separation and cut-growth resistance, and perhaps in fabricating properties.

Summary

Large truck tires have been developed containing 30% synthetic rubber which approach natural rubber tires in performance. An increase in the synthetic content of large truck tires above 30% is accompanied by a linear drop in carcass durability, a slight gain in natural rubber use efficiency, a sharp drop in synthetic rubber use efficiency, and a sharp rise in the cost per tire mile. In smaller sizes the effect may be less pronounced. Synthetic rubber treads are adequate for tread-wear resistance. Synthetic tires are more subject to heat, separation, and tread-crack failure. Testing season has a far greater effect upon tire operating temperature than the difference between natural and synthetic rubber treads. Satisfactory large truck tires containing more than 30% synthetic rubber can no doubt be developed if future research provides for polymer, compound, or construction improvements needed to give lower operating temperature, better separation and cut-growth resistance, and perhaps better fabricating properties.

ACKNOWLEDGMENT

The writers wish to thank the Reconstruction Finance Corporation, Office of Synthetic Rubber, for permission to publish these results. They especially wish to acknowledge the work of the Government Tire Test Fleet, its Manager, E. C. Read, and Technical Supervisor, B. C. Dial, in obtaining the tire data and in analyzing results.

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Vinyl Latex Aids in Restoration of Centuries-Old Art Masterpieces

THE use of durable Geon vinyl plastic helps make possible the restoration of centuries-old art masterpieces at the Museum of Fine Arts, Boston. By spraying liquid Geon vinyl latex, a product of B. F. Goodrich Chemical Company, on the print or drawing which has been painstakingly cleaned and pieced together, a coating is obtained which will protect the print or drawing for many years.

Francis W. Dolloff, a restoration expert in the museum's department of prints, believes that the use of Geon vinyl plastic will help prevent further decay and discoloration and give the paper and medium a protection never possible before. To protect the colors and seal the paper fibers from the effects of dirt, insects, gases, bacteria, oxidation and atmospheric conditions, the liquid vinyl plastic is simply sprayed on the restoration and allowed to air-dry. Several coats are usually applied to give the proper amount of build-up.

Although Mr. Dolloff has used the Geon vinyl plastic to aid in the restoration of old maps, charcoal sketches, and colored prints, probably the most interesting task, and certainly one of the more challenging, was that of the renovation of "Christ on the Cross," a Flemish fifteenth century woodcut thought to have been used in a small church or chapel as an alterpiece, and now in the collection of Lessing J. Rosenwald.

After 500 years of exposure to gases, atmospheric changes, dirt, dust, candle spatterings, and the devastating attacks of woodworms and silverfish (a wingless insect living chiefly on starches and sugars), the picture was in a sad state of decay. The woodcut was originally printed in brown ink on two sheets of paper and colored by hand, mounted on unplaned pine ¼-inch thick, and 21 x 33 inches in area.

Cotton swabs saturated with alcohol were rolled over the surface to remove the dirt and a white deposit probably caused by a protective varnish applied many years ago. The picture was then photographed in color and black and white, and an outline drawing was made on a special handmade all-rag linen paper that was to be the final backing.

Next, warm water was flowed over the panel for five minutes to loosen the print. Then the slow, tedious process of removing the various pieces of the picture from the panel and placing them on the scale drawing was undertaken. When the pieces were completely removed from the wooden panel they had to be further cleaned by floating them in water and then blotting out the excess moisture. The entire procedure of removing the picture from the wooden panel and then mounting it on the new backing took two people eight hours.

After drying the assembled picture under blotters for a week, it was put under infra-red lamps for five minutes to insure complete drying. Where the original paper was missing in a few places, color was touched in to pull the design together. The picture was then sprayed with Geon vinyl plastic latex, and the restoration was complete.

Combatting Air Pollution Problems in the Rubber Plant

TO REDUCE offensive odors from manufacturing processes, the U. S. Rubber Co. is testing, at an estimated cost of $10,000 a year, a new "odor counteracting" device installed in one building of its Eagle Street plant in Providence, R. I. This latest move in the company's campaign against air pollution has the blessing of city officials and is welcomed by residents of the area who have complained in the past about noxious odors from the plant.

Technically, the new process is known as "odor negation" or "counteraction," but it is a relatively old theory that was propounded around the turn of the century by a Flemish scientist, Hendrick Zwaardemaker. He found that many odors have odor opposites. When equal quantities of both are dispersed at the same time, the two odors combine and the combination either has no smell or is non-offensive.

The test system was installed in June, 1952, in the battery separator department at U. S. Rubber by Airkem, Inc., of Old Lyme, Conn. A deodorizing system was particularly needed in the department, according to a company official, because different kinds of disagreeable smelling sulfides are used in the manufacture of battery separators. In actual operation, the odor counteracting or "perfuming" device is not intended to do the job alone but is used as an auxiliary to existing methods.

Here is how the integrated system works: Fumes from the rubber vulcanization process are carried in steam or compressed air from the vulcanizers to a "flash tank." The flash tank allows the steam and air to expand suddenly. When the expansion occurs, much of the steam condenses to water, which carries off part of the odor through sewers. Some of the steam does not condense, however, and rises through an exhaust stack. This fraction of steam is further condensed in the exhaust stack by spraying it with water or with a fog-like mist.

Despite these two condensation processes, some of the odor would escape from the exhaust stack if it were not neutralized. This is where the odor counteracting device is used. A liquid deodorizing chemical, stored in a 50-gallon tank, is forced under air pressure through a series of fine nozzles near the top of the exhaust stack. The resulting spray combines with the fumes from the rubber vulcanization process and the combination is almost odorless.

The system was relatively easy to install but has been rather expensive to operate because of the high cost of chemical deodorant. Estimated average cost in the initial period has been more than $900 a month according to Peter J. McGuire, assistant plant engineer. On that basis, he estimated the yearly cost of operation for the one unit at $10,000. U. S. Rubber engineers, working with Airkem technicians, hope to reduce the operating costs, however, by finding cheaper substitutes for the chemical that is used at present.

Compounding Neoprene for Increased Resistance to Water

(Continued from Page 76)

stocks. Since the most commonly used temperature for testing is 70°C., this condition was selected for the experiments, but instead of employing a single exposure time of 7 days the test was extended to 224 days. Results obtained are given in Table VI. The neoprene stock cured with Pb_3O_4 is markedly superior to the one based on GR-S and is only slightly inferior to the stocks based on GR-S-65 and natural rubber.

The neoprene stock containing fine particle silica and cured with ZnO-MgO was difficult to evaluate in view of its previously discussed characteristic of passing through a maximum value. In the early stages of testing, it is inferior to natural rubber or GR-S-65, but at exposures longer than 112 days it is vastly superior to any of the elastomers tested.

TABLE VI—WEIGHT INCREASE (mg./in.²)

Compound ...	Neoprene-Pb_3O_4 B	Neoprene-Hi-Sil E	GR-S H	GR-S-65 I	Rubber G
Days at 70° C.					
7	16	89	64	9	12
14	23	99	88	13	16
28	31	74	133	18	22
56	47	66	239	33	34
112	86	61	614	86	87
224	326	54	2427	214	351

Summary

The effect of water on various neoprene compounds has been studied. Compounds cured with Pb_3O_4 are safer processing and are equal in water resistance to those cured with PbO. Conventional compounds cured with ZnO-MgO, while sufficiently resistant to water for most purposes, are inferior to Pb_3O_4-cured compounds. ZnO-MgO-cured compounds containing hydrated calcium silicate or fine particle silica differ from all others tested in that they exhibit equilibrium swell, and thus possess good physical properties even after extremely long immersions. Little difference was found in the water resistance of the various types of neoprene. Tests covering a range of temperature from 25°C. to 121°C. showed that maximum swell occurs at around 95°C. Aqueous solutions cause less swelling than distilled water, the degree of swell decreasing with the concentration of the solution.

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Limitations of Synthetic Rubber Packings for High Temperature Application

By E. L. CARLOTTA and E. M. HOBEIN

Parker Appliance Company, Cleveland, Ohio

THERE is a definite need for high temperature rubber compounds for use as molded seals in the various components of hydraulic and pneumatic systems on military and civilian aircraft. Intensified research on aircraft engines has produced greater thrust, expanded horsepower, and consequently more components or components of increased capacity must be accommodated throughout the air frame without excessive weight increases.

Increased performance of the aircraft engine plus the compactness of the necessary accessories results in higher ambient temperatures for the surrounding equipment, and as the power plant has been stepped up in performance, so have the accessory systems. The higher pressures which are developed in the hydraulic systems necessarily mean that more heat will be generated and consequently the rubber employed here is exposed to the higher temperatures. Likewise, the compactness of the hydraulic equipment results in the hydraulic lines running close to the heat generating units in the engine. The problem of heat dissipation is a very real one and is likely to grow larger as time goes on.

Thus, equipment which was designed initially to handle temperatures that were of average range must by necessity be modified to withstand the higher temperatures which are being produced. Any component which employs the use of synthetic rubber as a seal must have a seal composition which will withstand these increased temperatures, whether it be in the air, hydraulic fluids, or both.

The size of the problem puts great emphasis on introducing high heat resistance in synthetic rubber compounds. Nevertheless, it must be remembered that any given application demands a variety of characteristics from its rubber seals—static or dynamic. For example, a highly heat-resistant rubber seal without the expected resilience and deformability of rubber would be inferior to those made of harder materials, such as Teflon, Kel-F, and polyvinyl chloride, or of metal seals containing inert gases.

Thus, the designer actually requires heat-resistant rubbers which also possess a combination of other characteristics. So the compounder turns to special formulations to produce the necessary properties in the desired degree, often balancing one against the other, since there is no application that requires mere heat resistance alone. Several or all of the following properties are also involved:

1. *Extensibility:* The O-ring seals by deformation so materials with good flexibility are required.

2. *Resistance to the Fluid Being Sealed:* Various hydraulic oils and synthetic base fluids have varying effects on a given synthetic compound, so it is vital to use a sealing material which, when in contact with the fluid medium being handled, will resist not only chemical deterioration, but excessive swelling or shrinkage.

3. *Resistance to Temperature Range:* Few seals operate at one fixed temperature, and the rubber material must retain satisfactory properties over the entire service temperature range, which may extend from —100°F. to over 500°F.

4. *Adequate Strength Properties:* Elongation and torsional strength must be sufficient to withstand stretching during installation and twisting and abrasion resulting from motion of the parts. Low permanent set under compression at service temperatures is another important requirement.

5. *Precision Forming:* The rubber compound must be capable of being molded to very close tolerances if leakproof closures are to be produced.

Fortunately for the compounder, maximum properties in every category are not necessary for every application. High heat resistance, however, must be looked on as just one of the characteristics to be supplied by special formulation of synthetic rubber compounds.

High Temperature Effects on Rubber

In considering the high temperature limitations of rubber, we are entering probably the most confusing and controversial area of rubber technology. Many studies have been made of the static and dynamic aging of rubber at excessive temperatures and yet there are few theories for which contradictory evidence can not be found.

Since the advent of synthetic rubber, it has not been possible to establish a common unit of measure which could be used to indicate deterioration caused by heat. When natural rubber was the only consideration, it was possible to establish temperature limitations by examining the deterioration of the physical properties; however, in the case of synthetic elastomers, this evidence tells only a fraction of the story. The problem is further complicated by the numerous types of conditions under which synthetic rubber has been used.

A study of simple heat aging in synthetic rubber would only be of academic interest. In addition to heat, the rate and extent of deterioration will, in almost all applications, be affected by other factors—the type of oil, the amount of ozone present, the initial compression on the rubber, and the type of metal being used to mention only a few. In short, heat is but one of a number of interacting variables involved in deterioration, and the deterioration itself may take any one of a plurality of forms.

The Gough-Joule effect, which describes the relationship of applied stress to the generation of heat, is well known. In most sealing applications it is a phenomenon which contributes to the accelerated aging of rubber at elevated temperatures. It is, however, only a minor factor in the degradation of rubber caused by excessive heat.

When rubber is exposed to temperatures which are sufficient to cause a relatively rapid breakdown of the

Note: This paper was presented before the National Aeronautical Meeting of the Society of Automotive Engineers, New York, April 22, 1953.

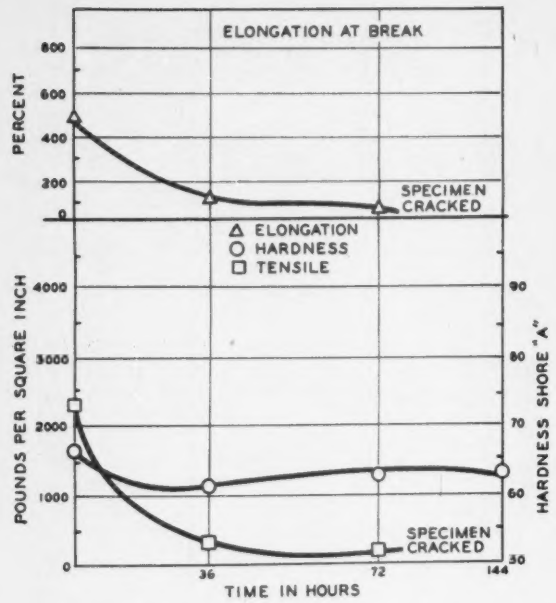


FIG. 1—Physical properties of a medium acrylonitrile Buna-N rubber. (No plasticizer in synthetic oil —MIL-L-7808—at 400°F.).

molecular structure, other processes which favor degradation are also accelerated. Thermoplastic properties show up and deterioration by oxidation occurs.

At the same time, though, there is always available within the rubber a potential for cross-linkage which will tend to repair some damage caused by degradation. If the design and environment of an application can be controlled to take advantage of this potential, it can in effect contribute to the life of a rubber seal or gasket. This means, of course, controlling temperature and strain which in many applications is not practical.

Maximum Temperature: The question often arises concerning the maximum temperature for which it is possible to use a given rubber compound. To adequately answer this question, it is necessary to examine the individual application and assess the result which aging will have on the effectiveness of the rubber in the application.

As an example of this, we can consider hardening of the rubber on exposure to dry heat. A 70 durometer Buna N rubber used at a temperature of 350°F. will in a relatively short time harden to 90 or 95 durometer. Will this hardening affect its useability? If it is being used as a vibration dampener, the answer is certainly "yes", and such a temperature exposure must be considered critical. However, we can not be so certain if the material is being used as a flange seal or even as a piston ring, especially if this change has been anticipated and the design adapted for it.

The problem is then twofold. After the best possible rubber has been obtained for a given application, it is the responsibility of the design engineer to utilize this material in a manner which will take into account the inevitable changes which it will undergo.

Design: There are several general rules with which every engineer designing rubber-containing units for operation at elevated temperatures should be familiar.

First consideration should be the relationship of fatigue or breakdown to the initial deformation. A rubber component should be designed to place it under the least possible initial stress. This is advisable since the rate of degradation will be directly proportional to the magnitude of this stress. Under this rule can be considered the problem of providing ample room for the swell experienced when rubber is exposed to certain oils or fuels. A rubber O-ring, for instance, when it is exposed to such oils, experiences hydrocarbon interchange and resultant swelling; if the groove or cavity does not provide sufficient room for the ring's enlargement, the penalty is excessive confinement and an increased rate of deterioration.

The second rule is to anticipate other physical changes in rubber components as a result of service conditions. Though already discussed, it cannot be over-emphasized that a change in physical properties of the rubber part should be expected. The design should have, whenever possible, provisions to minimize the effect of these changes.

Frictional Heat: Supplying adequate lubrication wherever rubber is exposed to relative motion might seem elementary. This rule is often violated, however, with the result that frictional heat is developed.

It is difficult and sometimes impossible to get an accurate measurement of frictional heat and therefore it is sometimes overlooked. A relatively moderate ambient temperature may then be unjustly blamed for a specific instance of seal deterioration. Frictional heat becomes more important as the seal becomes larger, i.e., as the ratio of volume to surface increases. Not only is more heat generated by the larger seal, but more heat is retained because rubber is a poor thermal conductor. The accumulation of high temperatures within the rubber as a result of friction is often severe, in which case it constitutes a real problem in the deterioration of the material.

In the field of pneumatics there are some perplexing problems in applications where rubber seals are exposed

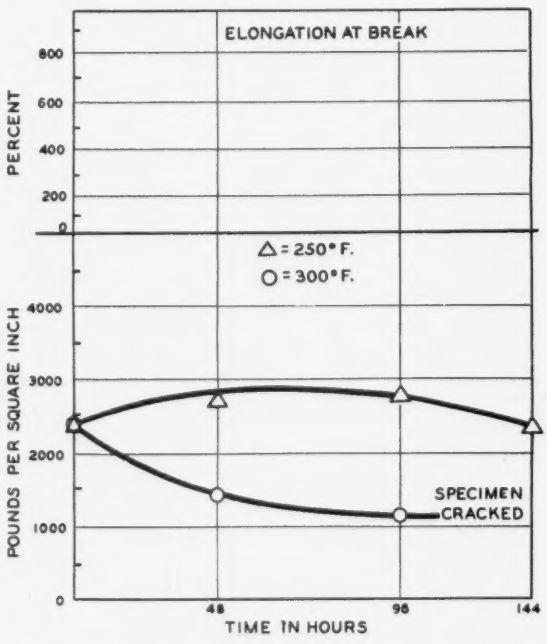


FIG. 2—Tensile strength deterioration in air at 250° and 300°F. (Buna-N compound, no plasticizer).

to relative motion and where adequate lubrication is impossible. If the resultant friction is at all significant, this type of application is not practical. However, such designs exist and must be considered. Here surface finish of the metal parts which the O-ring or seal is in contact with may be even more important than the selection of the proper synthetic compound.

The O-ring used as a rotary seal is an example of a specialized application where frictional heat together with abrasion resistance have been limiting factors. When adequate lubrication is possible, this type of seal has worked remarkably well in temperatures up to 300°F. and surface speeds about 700 feet per minute. New designs to permit better lubrication, such as skewing the O-ring groove with respect to the rotational axis of the shaft, may make this type of application more popular.

In addition to these principles, consideration in a design should be given to the incompressibility of rubber and the contribution of excessive deformation without lateral restraint to the formation and growth of flex cracks. Thus, if too much dimensional freedom be allowed a compressed O-ring in the plane normal to the stress, bulging will occur leading to damaging cracks.

In view of these considerations, it is evident that the designer of a rubber component can take up where the rubber technologist leaves off. Not even the most optimistic rubber chemist would advocate the use of presently available rubber compounds for extended periods of time over 450°F. However, the range between 300°F. and 450°F. is borderline, and it is in this range that the proper application of rubber in an accessory is most critical.

Rubber vs. Oils: Since the maximum temperature for which it is possible to use most hydraulic and lubricating oils is within this range, the problems with rubber at high temperature have not in most cases been insoluble. Of the applications which have not functioned properly with rubber the great majority utilized newer oils which are particularly severe on all elastomers. The synthetic, diester oils of the MIL-O-7808A type, are examples of this medium (Fig. 1). In recent months the rubber compounder has been able to extend the temperature limitation of rubber which can be used with this oil from 275° to 325°F. and more improvement is certain to be forthcoming.

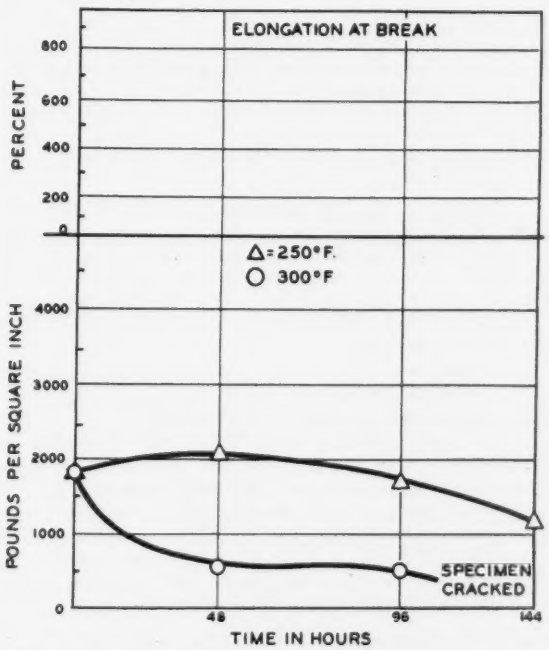


FIG. 2A—Tensile strength deterioration in air at 250° and 300°F. (Buna-N compound, 20 parts plasticizer).

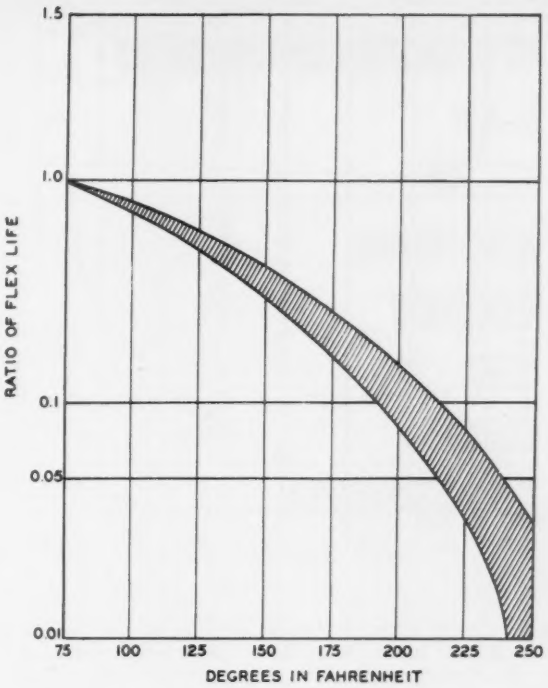


FIG. 3—Ratio of flex life at given temperature to that of room temperature (75°F.).

Static and Dynamic Aging: To illustrate the effect of static aging on rubber when exposed to high temperatures, two graphs have been prepared (Figs. 2 and 2A). Generally, it can be noted that when particularly high temperatures are present rubber will harden and consequently lose its resilience. A decrease in tensile strength and elongation is to be expected because of the molecular degradation which is effected. This same reduction in molecule size is responsible for the increased tendency to take a permanent set. The hardening is caused by the volatilization of the smaller molecular fractions within the rubber and the plasticizers which have been used in the compounding to achieve various properties. The net effect of this volatilization is of course to concentrate the solid pigments within the compound and decrease the amount of rubber and oil per unit volume.

Each type of rubber and each compound will respond to aging at different rates and to a different extent for any given temperature and time system. The total effect of these factors in a moving application—dynamic aging—is not so simply shown. The effect of initial strain, total amplitude and frequency are contributory to heat aging. The magnitude of their effect for one set of circumstances is shown in Fig. 3. The data for this graph was obtained with a flexing fixture similar to the DuPont Machine using Parker Compound 438-3, a Buna N base compound especially suitable for pneumatic service at temperatures up to 300°F.

By plotting the ratio of fatigue life at 75°F. against a

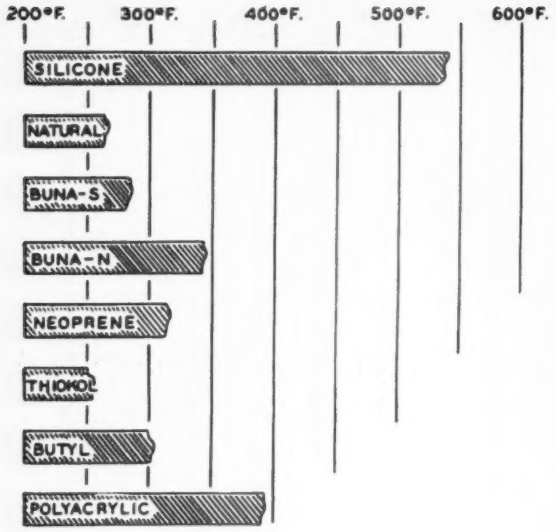


FIG. 4—High temperature limits of various rubbers.

given temperature, the deterioration of the rubber is shown to be much more rapid than would be expected in an unstressed condition. This illustrates, then, a practical method by which the serviceability of a rubber part may be extended. If a reduction in the amplitude and frequency of strain on the part can be brought about it will result in longer service.

Requirements of Rubber: Summarizing, if we consider the chemistry necessary to produce a material which will in some degree fulfill all of the characteristics we expect from rubber, it will be evident why heat might be called a natural enemy of rubber.

The five basic properties of synthetic elastomers—which together make them a unique engineering material for which there is no substitute in many hydraulic and pneumatic applications—are:

1. Practically complete return after extension or compression.
2. Rapid return after deformation.
3. Large reversible deformation.
4. Resistance to hydraulic oils and lubricating oils.
5. Reasonably high tensile strength and elastic modulus.

According to Schmidt and Marlies *(1)*, the primary requirement of a material with such properties is a "mass of high polymer chains for which the thermodynamically stable condition is a coiled, tangled disorder." Further, the individual molecules must be sufficiently attracted to each other so that temporary disentanglement will not result in a breakdown. There must be rapid motion within the molecule, however, not sufficient to displace the molecule as a whole.

In addition to degrading the polymer, heat can also supply the energy necessary to permanently displace the rubber molecule. A lower molecular weight and the displacement of molecules can clearly cause deterioration of all properties for which rubber is utilized.

If an application is such that one of the primary properties is super critical, it may be possible to obtain a rubber compound which has an excess of this property, thus providing leeway for considerable natural or accelerated heat aging before its usefullness is exhausted. This consideration together with the previously mentioned engineering precautions and methods make it impossible to place an exact maximum temperature on the useability of rubber.

The maximum for most applications is somewhere between 300°F. and 525°F. but precisely where this will fall will be controlled by the combination of properties required by the rubber, the suitability of the design, the length of service required, and the ingenuity of the engineer and rubber compounder.

Present Concept of a High Temperature Rubber

Presently available synthetic rubber compounds for use at elevated temperatures have top service temperatures which range up to about 525°F. (Fig. 4). This group is based on the following elastomers with the individual advantages and limitations noted:

Acrylonitrile Synthetic Rubber—This is the rubber sometimes designated as Buna-N. It is one of the most used of the seal molding rubber bases, in which group it is placed by its excellent resistance to petroleum oils and synthetic base lubricants. Buna-N compounds can be used with hydraulic fluids at temperatures up to about 300°F., and by proper formulation can be made serviceable to about 325°F., particularly with the di-ester type fluids. These compounds have low permanent set, superior characteristics as to tear and tensile strength, sunlight and ozone resistance, and can be compounded to function effectively at base temperatures of minus 75°F. or lower.

Silicone Elastomers—Although silicones in one form or another have been available since 1943, the question: "What are silicones?" is still frequently heard. Boiled down to basic essentials, silicones are simply a new and entirely synthetic combination of organic and inorganic substances possessing properties of each. The inorganic substance is silicon, a principal constitutent of sand and glass, which explains why silicone compounds have outstanding resistance to heat, cold, chemicals, and the weather. The organic member consists of one or more hydrocarbons and from these the silicones get their flexibility. By varying the organic partner, the chemist has been able to produce silicones ranging in form from volatile liquids to dense solids. Silicone rubber is valuable for one or more of its four basic properties. Each main property has a number of interesting sub-characteristics, any one of which may provide a solution to high temperature sealing problems. The following are the four basic properties of silicone rubber:

1. *Resistance to Temperature Extremes:* Temperatures as high as 450°F. have little effect on the physical and electrical properties of silicone rubber (Fig. 5), an outstanding property and an important factor in many applications. Low compression set at high temperatures plus high thermal conductivity are also important properties to be considered.
2. *Release from Sticking:* Silicones release readily from sticky materials over a wide temperature range because of the inert surface of the material.
3. *Inertness:* Silicones resist many aircraft hydraulic fluids and lubricating oils; however, MIL-O-5606 types cause severe deterioration at high temperatures (Fig. 6). Compounds are non-corrosive and are chemically stable at temperatures over 600°F.
4. *Unusual Surface Properties:* Silicone compounds have excellent weather resistance and superior aging properties compared to most other synthetic elastomers.

Fluoro-Elastomers—This group is comprised of such materials as Teflon, Kel-F, and the like and are important when used for simple gasketing, where their properties of virtual chemical inertness and good resistance to

temperatures up to about 400°F. are valuable. Fluoroelastomers have rather poor elastomeric characteristics as compared to synthetic rubber, and when formulated into compounds for improved flexibility most of the elastomers present an added problem in that the plasticizer used reduces strength, chemical and heat resistance.

Acrylic Rubber—Acrylic rubber vulcanizates because of their chemically saturated nature show excellent heat and hot oil resistance up to 350°F. Above that temperature, they show accelerated loss of weight in air, a negative swell in oils, and become hard and brittle in shorter periods of time. This group is made up of such rubbers as Hycar 4021, Lactoprene, and Acrylon BA-12 and EA-5. They are similar to each other in many respects and are recommended for applications where the following properties are desired.

1. Resistance to air temperatures up to 350°F.
2. Resistance to hot oils of low analine point and extreme-pressure lubricants up to 350°F.
3. Resistance to flex cracking.
4. Resistance to oxidation, ozone, and sunlight.

Their tendency to take a permanent set or to cold flow at only moderate temperatures is a limiting factor and resistance to most hydraulic oils is unsatisfactory. The acrylic rubbers are recommended in applications where advantage can be taken of their special properties in:

O-rings	Diaphragms
Oil Seals	Grommets
Coolant Seals	Water Seals
Gaskets	Protective Covers
Packings	Hose

Consideration of Compounding Ingredients

Along with the consideration of high temperature base elastomers, we must also include the other constituents of a compound mixture. These include the plasticizers contained, the antioxidants or age resistors used and the accelerators necessary to produce high temperature compounds. We shall discuss them briefly in the order that they are listed.

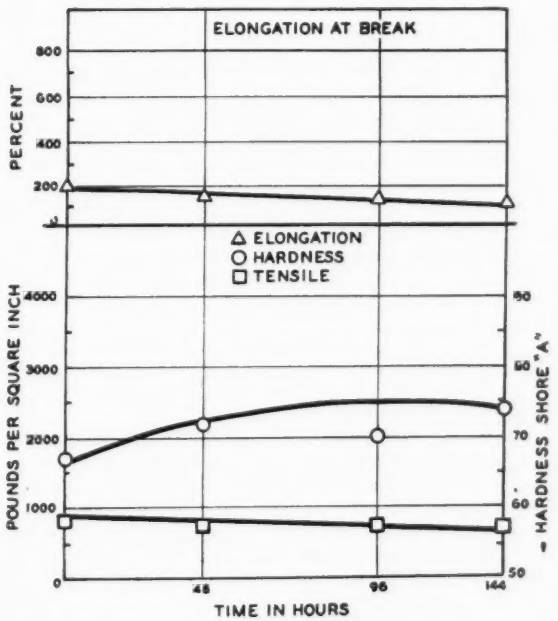


FIG. 5—Physical properties of a silicone rubber compound in air at 450°F. (G-E Silicone Gum SE-76).

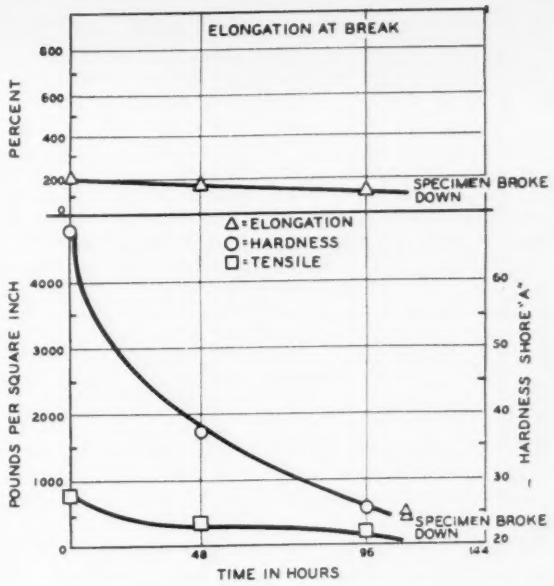


FIG. 6—Effects of hydraulic oil (MIL-O-5606) on silicone rubber at 250°F. (G-E Silicone Gum SE-76).

Plasticizer research and plasticizer developments in recent years have been extensive, and today the rubber compounder has at his disposal a wide variety of plasticizers. Selection of the proper plasticizer, the plasticizer combinations and concentration are the preferred methods of obtaining the optimum properties in the final product. The ideal plasticizer for high temperature operations should exhibit permanence, so that its effects will persist throughout the service life of the final product. It should, therefore, possess zero volatility. It should be highly efficient, imparting maximum flexibility with minimum loss in strength. Actually, no one plasticizer fills all of these needs simultaneously. For example, plasticizers which are most efficient are usually also most fugitive (Figs. 7 and 7A). Synthetic rubber compounds for operating temperatures beyond 300°F. usually contain no plasticizers or other anti-oxidizing materials which might migrate to the surface, evaporate, and cause hardening and cracking of rubber.

Plasticizer loss through evaporation or volatilization can occur at room temperatures and is greatly accelerated at elevated temperatures. Whenever a plasticizer is lost from the material it plasticizes, there is an initial increase in tensile strength. Hardness and modulus also increase. The rubber first becomes stiff and "boardy" and ultimately cracks on flexing. Shrinkage also occurs and seals manufactured to rigid dimensional specifications are seriously distorted. The use of no plasticizers at all in high temperature compounds minimizes these problems. It must be pointed out, though, that the low temperature flexibility of a compound is a function of the plasticizer contained. The degree to which the plasticizing element can be eliminated depends on the polymer and the lower temperature limit set for the service contemplated.

Other factors of primary consideration in the compounding of high temperature synthetic rubber are the antioxidants or age resistors, and the acceleration

technique necessary to produce resistance to higher temperatures. If a substance inhibits oxidation, it is properly termed an antioxidant. An age resistor is a substance or a material which when incorporated into a rubber compound helps to protect the vulcanizate against certain kinds of aging. Either term is suitable for ordinary use. The most important elements of aging retarded by antioxidants are oxidation, flex cracking, atmospheric cracking, heat deterioration, and copper or manganese deterioration. No one antioxidant serves all purposes.

In choosing the proper antioxidant for a particular compound, consideration must be given to the conditions under which the product is to be used or kept. It is common practice to use a combination of two antioxidants in a compound for improved aging. The combinations are usually superior to any single antioxidant and permit the use of larger proportions of antioxidants without the danger of bloom.

As for acceleration, the use of organic vulcanizing agents can radically reduce the proportion of sulfur required for curing. Acceleration of this kind imparts important benefits from the point of view of heat resistance. The advantages of low-sulfur and sulfurless acceleration are as follows:

1. Produces low compression or permanent set.
2. Allows easy processing.
3. Permits the widest range of any type of acceleration.
4. Imparts the best aging of any type of acceleration.
5. Last but not least, provides the best heat resistance of any known acceleration technique.

Outlook for Enhanced Heat Resistance

The authors have taken a liberal view concerning the heat-resisting potential of the presently available elastomers. This is justified on the basis of improved design and better rubber compounding. However, the need for rubbery materials which will operate for long periods of time at temperatures exceeding 450°F. is increasing and this growing necessity absorbs more and more attention.

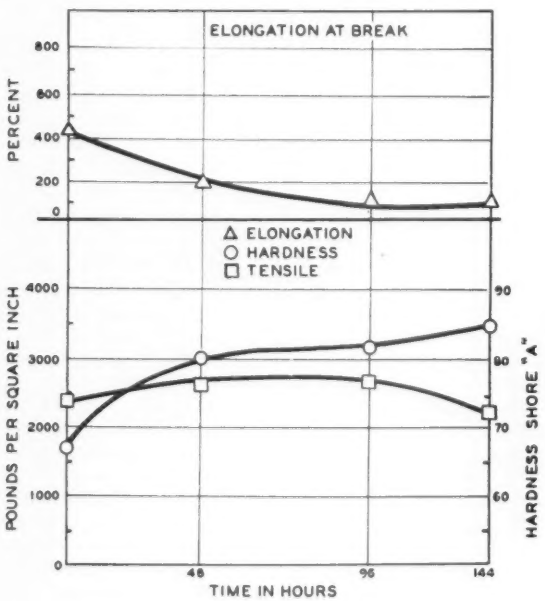


FIG. 7—Physical properties of a medium acrylonitrile Buna-N compound in air at 250°F. (No plasticizer).

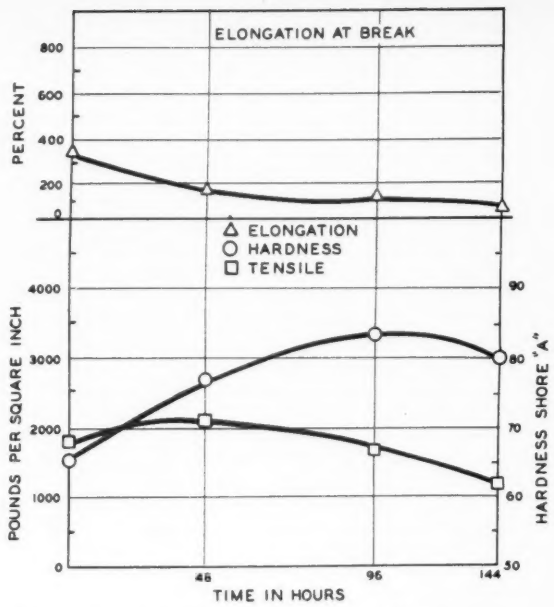


FIG. 7A—Physical properties of a medium acrylonitrile Buna-N compound in air at 250°F. (20 parts plasticizer).

Polyacrylates—Of the base elastomers discussed, two types—the polyacrylics of the Hycar 4021 type and silicones—are relatively new materials, and it is difficult to predict what improvements will be made by the development of new compounding techniques and the use of new compounding materials. Just as the development of "sulfurless" curing agents increased the heat resistance of the conventional polymers, so the development of new curing agents for these materials will conceivably improve their properties.

Silicones—The silicones have been rapidly gaining popularity in the aircraft industry during the past few years and undoubtedly only a small part of their potential has been realized. The silicones at this time offer the most satisfactory answer to dry heat-resistant rubber requirements. Their excellent resistance to temperatures up to 500°F. is well known and need not be elaborated on here. Their oil resistance and mechanical properties are not equal to the organic rubber, though definite improvement is being made in this direction. The problem of decreasing these deficiencies is being studied from two directions.

Fundamental research is being conducted to modify the silicone rubber molecule to provide base elastomers with enhanced properties. At the same time, the rubber compounder is working to develop new compounding materials and techniques to boost the usefulness of the basic gum now available. The effectiveness of this dual approach has been amply demonstrated with the conventional organic elastomers. In this way only is it possible for the rubber fabricator to develop specific materials for the thousands of applications required by the aircraft industry.

In the short period of two years, the physical properties of silicone rubber have been increased from a maximum tensile strength of 800 psi and an elongation of 300% to tensile strengths of 1600 psi and elongations of

(Continued on Page 134)

Editorials . . . . . .

Save the Library

SOME three years ago the Division of Rubber Chemistry of the American Chemical Society authorized the establishment of a Rubber Library to be operated under the auspices of the Division. Akron was the logical site for a library of this nature and accordingly a satisfactory deal was worked out with the University of Akron for housing, supervision, etc. A special Library Committee was established by the Division and a special librarian was chosen. The Committee worked up an agenda of functions for the library and this program has been faithfully followed in the past three years.

It takes a good deal of money to run a library and to cover the services of a paid librarian. Costs of the Rubber Library to date have been borne by the Division, plus generous donations from the Rubber Manufacturers Association, plus contributions from the industry. The donations and the contributions, unfortunately, have been largely exhausted, and the Executive Committee of the Division has decided that it would be too much of a drain on Division funds to maintain the library from such funds. Accordingly, and based solely on the financial aspects involved, the Executive Committee at its last meeting in Chicago decided to withdraw its financial support from the Rubber Library. There are sufficient funds on hand to maintain the library for another few months, but beyond that its continuance is doubtful.

We find no fault with the members of the Executive Committee in reaching a negative decision in this instance since, as it was announced at the business session in Chicago, the annual cost of operating the library is greater than the annual net income of the Rubber Division. We do, however, feel that it would be a serious mistake on the part of the rubber manufacturing industry at large to let the library die, aborning as it were. The rubber manufacturing industry is now big business, with total annual sales running over $5 billion dollars, and the technologists of the field can use a central library to definite advantage. We think some of these advantages have been overlooked, and in some cases ignored, by the industry.

Despite publicity given to the activities of the Rubber Library, particularly in the rubber journals, technologists are still not aware of the services of which they can avail themselves. For example, the library prepares special bibliographies on request—and makes no charges of any kind for such bibliographies. Copies of these bibliographies, once prepared, are maintained on file and can be secured without cost on request. There are bibliographies available on the use and application of O-rings, the drying of adhesive-coated fabrics, the use of plasticizers in GR-S, the determination of ozone in air, operation and safety factors in mills and calenders, and on the use of synthetic resins in natural and synthetic rubbers. More than 20 such bibliographies have been prepared, every one of which is of practical value to rubber technologists, and yet the demand for copies has been relatively negligible.

How many times has a rubber technologist wished to lay his hands on some out-of-print book or some almost forgotten technical report? The Rubber Library has prepared a Union List of Books and a Union List of Serials. These lists represent the combined holdings of the major rubber companies (and others) and the literature covered by these lists can be borrowed through the library on an inter-library loan basis by any accredited member of the rubber industry. This service has been more widely recognized by the industry, as attested to by the fact that over 620 inter-library loans were made in the first 18 months of existence of the Rubber Library. This is a practical service, one which the industry has long needed, and it would disappear with the liquidation of the library.

We are fully aware of the fact that all of the rubber manufacturers and all of the suppliers are not completely sold on the necessity of maintaining a Rubber Library. Many of these organizations have comprehensive libraries of their own and the funds to secure special services, such as the preparation of bibliographies on specific subjects. The smaller manufacturers and suppliers, however, are not quite in the same category, although they play in the same league. However, as Lincoln once phrased it, every man owes part of his time to the industry of which he is a part, and we could easily paraphrase that text to cover the thought that every manufacturer and supplier owes a little to the general benefit of the industry of which he is a participant.

We are not ignoring the fact that it takes money to operate the Rubber Library, but we feel that not all channels for such money have been explored. For instance, might it not be possible for each of the local rubber groups to make an annual contribution to the library? Could not a further effort be expended to convince manufacturers and suppliers of the need for the library, so that more substantial contributions would be forthcoming? We are sure there are other avenues open for consideration. It is quite possible that the Rubber Manufacturers Association would continue making annual donations to the library. It is even possible that the Executive Committee of the Rubber Division may review its recent decision. Every member of the Division has a voice in its operation, and we hope voices will be raised quickly to avoid the scheduled liquidation of the Rubber Library.

NEWS OF THE MONTH

RFC ANNOUNCES NEW SALES POLICY FOR GR-S; PRESIDENT NAMES TWO TO DISPOSAL COMMISSION

ON September 30, Kenton R. Cravens, administrator of the Reconstruction Finance Corporation, announced a new sales policy for certain synthetic rubber products manufactured in the government's rubber-producing facilities. Under the new policy, orders for dry GR-S placed with RFC by rubber manufacturers will be firm and binding agreements, not subject to cancellation. The new policy was formulated to help RFC anticipate consumer demands, schedule production more evenly and avoid unwarranted high inventories. As the RFC was adjusting its sales procedures, several published reports appeared which stated that the agency stands to make nearly 19% profit on sales of $360,000,000 to $370,000,000 of synthetic rubber in fiscal 1954. The total profit, it is estimated, will reach $70,000,000 against the $62,000,000 profit recorded in fiscal 1953. It is expected, however, that the amount of synthetic rubber sold by RFC in fiscal 1954 will be less than was sold in the previous fiscal year. Meanwhile, on October 6, President Eisenhower appointed two of the three members of the Rubber Producing Facilities Disposal Commission, which will dispose of the government-owned synthetic rubber plants.

The two members named by President Eisenhower are Everett Richard Cook of Memphis, Tenn., and Leslie Raymond Rounds of Kennebunkport, Me. It was also reliably reported that the third member of the commission was to be Lyford C. Hutchins, chairman of the board of the Winchester Arms Co., Winchester, Mass. At this writing, however, no official announcement was made of Mr. Hutchins' appointment.

Mr. Cook is president of Cook & Co., cotton merchants and export concern. He was born in Indianapolis fifty-nine years ago and entered the cotton business in 1916. He is president of the American Cotton Shippers Association and a member of the New York, New Orleans and Memphis Cotton Exchanges. He was a brigadier general in the United States Air Force during World War II.

Mr. Rounds is first vice-president of the Federal Reserve Bank of New York. He is 67 years old. He joined the Federal Reserve Bank of New York in 1917.

To Study Disposal Question

Mr. Cook and Mr. Rounds, together with Mr. Hutchins, if his appointment goes through, will be charged with studying the disposal question and making a recommendation to Congress by early 1955. Congress voted this disposal method when it took up the matter of selling the synthetic plants earlier this year.

The Rubber Disposal Act of 1953 was designed to achieve three objectives suggested by the President in a message to Congress last April. These are: that the national security shall be safeguarded, that a free competitive synthetic rubber industry shall be established, and that the government shall realize the full fair value of the plants upon their sale to private ownership.

Changes Sale Procedure

In its announcement on a change in the sales procedure for dry GR-S, RFC stated that the procedure and basis for sales of GR-I, GR-S latex and the dry GR-S polymers of small production, which have been excepted, remain unchanged.

The amended regulations provide that large manufacturers (purchasers of 750,000 pounds or more of GR-S in any one of the months of June, July or August, 1953) will be required to place firm orders on a 90-day forward basis. More than 700 small manufacturers, who comprise the vast majority of RFC purchasers, will submit firm purchase orders on only a 30-day forward basis.

Under the new procedure, large manufacturers must place orders for November shipments not later than October 10. Orders for December, 1953, and January, 1954, must be filed with RFC by October 15. Large purchasers requesting shipments during any month after next January must forward firm orders not later than the 15th day of the third month prior to the month in which shipments are requested.

Small purchasers are required to submit their firm orders by the 10th of the month prior to the month shipments are requested. All purchasers will have firm price protection during the term of the agreement and will be granted the benefit of any price reductions before shipment.

The purchase price under purchase orders and forward orders submitted before designated deadlines will be the published price of RFC (plus uniform freight charge) on the transmittal date. The purchase price under purchase orders and forward orders submitted subsequent to the deadline, will be the published price of RFC on the transmittal date, plus one-quarter of a cent per pound.

Estimates on RFC profit on sales of synthetic rubber during fiscal 1954 take into account the costs of putting some synthetic plants into mothballs as total production adjusts to lower demand. In fact, getting rid of these so-called "inefficient" production lines is the reason for the higher profit margin, experts explain.

Last year, with well over 600,000 tons of synthetic rubber sold, the government opened up its most expensive pipelines to keep up with demand. GR-S made with alcohol-butadiene is said to be a break-even or losing proposition at 23c a pound. This expensive operation is no longer in use. Recently, the alcohol lines were shut down. It was also expected that certain higher-cost petroleum-based synthetic facilities also will go into standby soon.

Operating with the lowest priced petroleum stocks, the margin of profit will be as great as ever, even though production is lower. The saving on efficiency balances the production loss "within a penny." This is said to be so because synthetic rubber making is essentially a matter of pipes and valves, with relatively little labor involved and feedstocks accounting for 75 to 80% of cost.

The rubber industry, confident that business will stay good, predicts that 570,000 tons of synthetic will be produced in calendar 1954. A major portion of the difference between 1954 and 1953 production will be made up in increased imports of natural rubber. It is to be noted that natural rubber has been selling for slightly less than GR-S in the past few months.

Shafer Comments on Disposal

As briefly reported in the September issue of RUBBER AGE, Representative Paul W. Shafer (Rep., Mich.), in a recent address before the Manufacturing Chemists Association, made some interesting comments on the present disposal picture. Mr. Shafer made an urgent plea for early

placement of U. S. synthetic rubber production in the hands of private producers so that America's position in Southeast Asia can be saved. At the same time, he warned that present Congressional provisions for such disposal are not likely to expedite the transfer.

Mr. Shafer asserted that in the opinion of many people in the natural rubber producing areas of Southeast Asia, "our government-owned monopoly is . . . a dagger being slowly and insidiously inserted in their heart and gradually twisted to such an extent that all of the goodwill we have created in the years gone by is disintegrating."

He stated that the natural rubber people want to compete against synthetic rubber, but feel that they confront unfair competition in a wholly-owned U. S. government monopoly. Mr. Shafer agreed that in the past there had been understandable reluctance on the part of government to release control over such an important defense item as synthetic rubber; and he also noted that private industry had entertained uncertainties whether synthetic rubber could in fact compete in price and quality with the natural product.

Commends President's Action

Events and technology have answered in favor of synthetics, Mr. Shafer noted. Therefore, he said, President Eisenhower's message of last April 14 asking for action on plant disposal was admirably timed.

However, Mr. Shafer, who recounted legislative difficulties in coming to an agreement on proper procedure, insisted: "I would be less than candid if I did not tell you that I have doubts as to whether there will ever be anything sold under this act. . . . What we have is a disposal act containing inconsistencies, overshadowed by unreasonable requirements and practically begging for political log-rolling.

"It is conceivable," he continued, "that under the circumstances our synthetic rubber industry may become one of the biggest white elephants in the history of government. The new developments with respect to polyesters may make our present facilities obsolete. Developments in Butyl rubber may seriously depress the value of existing copolymer plants. The only restraint now in existence is the possibility of government competition but if the demand for new rubber increases to such an extent that private industry can compete with government, we may possibly find private industry constructing synthetic rubber facilities considerably more efficient than those now in existence.

"If this does happen, the government facilities may rapidly become obsolete. That, coupled with the charges that will be made against any members of big business who bid on these plants, may cause a considerable lack of enthusiasm in purchasing these facilities to spread among possible bidders," he declared.

Natural Consumption Rises

News of natural rubber came from the U. S. Department of Commerce, which recently reported that the world consumed more, but produced less, natural rubber during the first seven months of 1953 than in the corresponding period last year. It said production in 1953 totaled 977,500 long tons, including 152,500 long tons in July. This compared with output of 1,020,000 long tons in 1952's first seven months.

Natural rubber consumption rose this year to 907,500 tons from 840,000 tons for the like months a year ago. July, 1953, consumption totaled 117,500 tons. The department said these figures included estimated imports in Russia and China of 1,000 tons in July, 74,500 tons in the first seven months of 1953 and 86,500 tons for the 1952 period.

During the same months, synthetic rubber production outside Russia increased to 597,500 tons, including 87,000 tons this July. This compared with synthetic production of 539,145 tons in the January-July period last year. Synthetic consumption outside the Soviet Union also rose above a year ago. This year, consumption mounted to 552,000 tons, including 67,500 tons in July, compared with a seven months total of 512,500 tons in 1952.

Commerce Department officials said high United States consumption this year accounted for much of the rise in use of both types of rubber. For the first seven months of this year, they said, U. S. consumption "soared" to 834,404 tons from 717,829 tons in 1952.

World natural rubber stocks at the end of July totaled 820,000 tons, up 2,500 tons over December 31, 1952. This included 235,000 tons in producing countries, 397,500 tons in consuming countries (excluding Russian and Chinese stocks and government stocks in the U. S., the United Kingdom and France) and 187,500 tons afloat.

Ceylon Debating Action

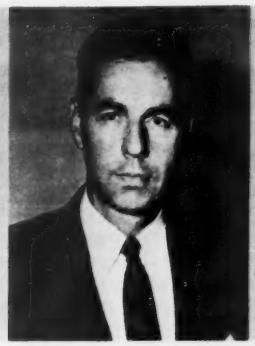
According to recent advices reaching this country, the Ceylonese government will decide shortly on a recommendation by the International Bank for Reconstruction and Development that the total area under rubber cultivation in Ceylon should not be increased, and might even be decreased. This recommendation was made to the government after a representative team from the World Bank had investigated Ceylon's economic and agricultural potentialities. The country has nearly 700,000 acres under rubber, of which 34% is European owned. The remainder is under Ceylonese ownership.

Ceylon's annual production of rubber totals 96,500 tons, of which 50,000 are shipped to Communist China under a five-year contract. The remainder is sold in the open market. The chief buyers of Ceylon rubber at the open market price are the United States and the United Kingdom. Last year the United States bought nearly 17,000 tons of Ceylon rubber and the United Kingdom purchased 15,000 tons.

The World Bank's recommendation to stop an increase in Ceylon's rubber acreage was meant to assure that rubber yields would be improved rather than that acreage should continue to expand at the expense of quality of yields. In the absence of any effective check on expansion of acreage, an average of 1,500 acres of new rubber is planted annually.

REEVES BROTHERS ACQUIRES VULCAN RUBBER PRODUCTS AND DUROFLEX

E. C. Hemes



D. J. McKnight

C. Haas

Reeves Brothers, Inc., New York, N. Y., has announced the acquisition of the Vulcan Rubber Products Corp. of Brooklyn, N. Y., and Duroflex, Inc. of Buena Vista, Va. Both companies are producers of industrial coated fabrics and both will become separate corporate subsidiaries of Reeves Brothers. All assets, properties, machinery and trade names will come under Reeves ownership and management. Vulcan Rubber was established in 1911, while Duroflex was established in January, 1953 by E. C. Hemes, who had formerly been executive vice-president of Vulcan Rubber. The principals of the new Reeves subsidiaries will be John M. Reeves, president of Reeves Brothers, who will also assume the presidency of both Vulcan Rubber and Duroflex; E. C. Hemes, who well be vice-president and general manager of both subsidiaries, and Dale J. McKnight, who will become sales manager for both subsidiaries. Mr. McKnight was formerly sales manager for the Radel Leather Manufacturing Co. of Newark, N. J. Carl Haas, who joined Vulcan Rubber as plant manager in August of this year, will continue in that capacity. He was formerly plant manager of Stokes Molded Products of Trenton, N. J. Current plans are to continue operations at both the Vulcan Rubber and Duroflex plants. Research and laboratory facilities will be broadened under the Reeves management.

WALTON, BALL AND NEAL HEAD ACS RUBBER DIVISION FOR 1953-54

Announcement of the election by letter ballot of new officers for the 1953-54 season was one of the highlites of the 64th meeting of the Division of Rubber Chemistry of the American Chemical Society. The meeting, held at the Hotel Sherman in Chicago, Ill., on September 9 to 11 in conjunction with the 124th Meeting of the parent society, attracted an official registration of slightly over 800, with total registration estimates ranging as high as 950.

The major feature of the meeting, of course, was the presentation of the 21 technical papers spread over three separate sessions, with the retiring chairman, Seward G. Byam (DuPont), presiding over the first session, A. E. Neal (DuPont) over the second, and A. E. Laurence (Phillips Chemical) over the third. Abstracts of all of the papers were published in our July, 1953, issue. Other activities included a luncheon-meeting of the 25-Year Club, the regular business meeting, the presentation of the 1953 Charles Goodyear Lecture, the divisional banquet, which was preceded by the annual suppliers' cooperative cocktail party, plant visits, and a special program for the ladies. A few surprises were also sprung on members and guests.

New Officers for 1953-54

Results of the letter ballot, with over 1100 votes cast, were announced at the business meeting by M. E. Lerner (RUBBER AGE), representing the Tellers Committee. The election results were as follows: *Chairman,* James C. Walton (Boston Woven Hose & Rubber Co.); *Vice-Chairman,* John M. Ball (Midwest Rubber Reclaiming Co.); *Secretary,* Arthur M. Neal (DuPont Rubber Chemicals Division); *Treasurer,* Amos W. Oakleaf (Phillips Chemical Co.); *Director-at-Large,* G. R. Cuthbertson (U. S. Rubber Co.).

The following directors were elected to represent various local rubber groups for two-year terms: *Connecticut,* George R. Sprague (Sponge Rubber Products); *Detroit,* William J. Simpson (Chrysler); *Northern California,* Robert D. Ford (Mare Island Rubber Laboratory); *Philadelphia,* T. W. Elkin (Armstrong Cork); *Rhode Island,* Francis W. Burger (Kleistone Rubber); *Southern Ohio,* James R. Wall (Inland Mfg.); *Washington, D. C.,* Richard E. Harmon.

John M. Ball
Vice-Chairman

Of special interest at the business meeting was the report of John Hoesly (Goodyear), chairman of the Membership Committee, which indicated that divisional membership as of September 1, 1953, amounted to 2774, of which 2326 were regular members and 448 were associate members. In addition, there were 653 nonmember subscriptions to *Rubber Chemistry and Technology,* making for a grand total of 3427. The present figure represents a 21.5% increase over the grand total of 2820 reported in October, 1951, and represents an increase of 213 members in the past year.

It was announced at the meeting that the Executive Committee had voted to withhold further financial support from the Divisional Library which has been functioning at the University of Akron for the past three years. Chairman Byam pointed out that the cost of operating the Library was greater than the average net income of the Division and, accordingly, the committee was obliged to relinquish its support. There are sufficient funds on hand to continue operation of the Library until next March, but its operation beyond that time is questionable.

Meeting dates for the next three years were also announced during the business session. These are as follows: Louisville, Kentucky—April 14-16, 1954; New York City — September 15-17, 1954; Detroit, Michigan — May 4-6, 1955; Philadelphia, Penna. — November 2-4, 1955; Montreal, Canada—May 16-18, 1956; Atlantic City, N. J.—September 19-21, 1956. Fred Wagner (DuPont) will be chairman of the local arrangements committee for the Louisville meeting, and Joseph Breckley (Titanium Pigment) will act in a similar capacity for the New York meeting. The Montreal meeting in 1956 will probably be held in conjunction with the Rubber Chemistry Division of the Chemical Institute of Canada. The Spring, 1957, meeting will be held in Cleveland, and the Fall, 1957, meeting in New York, the latter in conjunction with the parent society.

One of the final actions by Chairman Byam at the business session was his payment of tribute to Messrs. Walton, Haynes, Oakleaf, Semon and other officers and directors of the division for their able support during his tenure as chairman.

Blake Delivers Goodyear Lecture

Another highlite of the meeting was the presentation of the 1953 Charles Goodyear Lecture by Medalist John T. Blake of the Simplex Wire & Cable Co. Taking as his subject "The Future of Rubber," Dr. Blake presented his talk at the close of the technical session on Thursday morning, September 10. In opening his talk, the speaker indicated that the future is only an extension of the past and accordingly he intended to examine the past and then extend it by extrapolation.

James C. Walton
Rubber Division Chairman

In looking at the past, Dr. Blake first referred to materials, methods and products in vogue some thirty years ago and then detailed the progress made to date. For example, he referred to passenger car tires which required air pressures of 50 to 75 pounds, to the exclusive use of litharge as accelerator, to the belief that vulcanization was a specific reaction rather than a general one, to the fact that carbon black and zinc oxide were the only available reinforcing fillers, to the fact that natural rubber was the only polymer in use and sulfur was the only vulcanizing agent used, and to the development of the oxygen bomb which was announced at the first meeting of the Rubber Division which he attended.

Predictions for Future

Based on the developments he has personally witnessed in the past three decades, Dr. Blake was prompted to make several predictions for the future. Among these were: (1) Vulcanization systems will be developed which will give materials whose properties will be far superior to anything we have seen; (2) The word "rubber" is going to have less and less of its original meaning; (3) We may have colored rubbers which will be as tough as present black compounds; (4) Work with the new isocyanate rubbers, the new fabrics and new reinforcing fillers will result in tires which will last the life of an automobile.

Turning to the supply-and-demand situation for new rubber, Dr. Blake utilized a series of charts to cover consumption requirements since the turn of the century and to estimate future requirements. He pointed out that per capita use of rubber has increased from a little over an ounce in 1850 to approximately 20 pounds at present. Estimating that world consumption of new rubber may easily exceed 3,000,000 long tons per year by 1960, he expressed the belief that the future of the world and particularly that of the United States lies in the field of synthetic rubber, primarily because the production of natural rubber is rapidly reaching maturity. In this connection he emphasized the point that "the output of natural rubber in recent years has not been equal to world demand for rubber and it will never be equal again."

Arthur M. Neal
New Division Secretary

Urging the government to turn over the synthetic rubber producing facilities to private industry as soon as possible, Dr. Blake stated that it is no longer a question of whether synthetic rubber can stand on its own feet. Within three or four years, he said, the United States will need additional synthetic rubber production. It takes time to build plants and the need must be anticipated. The American rubber industry welcomes this challenge, he stated, and it will produce sufficient quantities of new materials of superior quality and at a reasonable price.

In closing his lecture, Dr. Blake predicted that there will be many radical changes in our technology in the next decade, with many new materials and substantial improvements in present ones. He stated it was a satisfying privilege to work in the rubber industry in the years that have passed and to have participated to some extent in the remarkable developments achieved.

Luncheon and Banquet Held

Activities at the Chicago meeting started as usual with a luncheon-meeting of the 25-Year Club. H. A. Winkelmann (Dryden Rubber) acted as chairman at the luncheon, the 11th to be held, and which attracted some 130 members. Several new club members were introduced as were several special guests, including Dr. D. Parkinson and Mr. F. J. Tibenham, both of the British Dunlop organization, and both of whom delivered papers at the technical sessions. A list of members of the 25-Year Club was distributed to those present through the courtesy of C. M. Baldwin, Chicago representative of the United Carbon Co.

Following usual practice, E. B. Curtis (Vanderbilt) conducted a survey to determine the member present with the longest period of active service in the rubber industry. Since several members present had previously been honored for such service, the award at Chicago, consisting of a money clip, went to Frank Malm, formerly associated with the Bell Telephone Laboratories and now acting as a consultant. Mr. Malm has had 46 consecutive years of service in the rubber field. It was announced that the next meeting of the club would be held during the Louisville meeting, with Al Brandt (Goodrich Chemical) as chairman.

The divisional banquet, held at the Hotel Sherman on Thursday evening, September 10, was attended by some 700 members and guests. It was one of the best banquets held by the Division in recent years, featuring an excellent dinner followed by unusually good entertainment. The latter was of the variety type, and included several excellent performers. As stated, the banquet was preceded by the annual suppliers' cooperative cocktail party, which was well handled and well attended. C. M. Baldwin (United Carbon) was chairman of the cocktail party, and Francis Frost was in charge of the banquet and entertainment.

In opening the formal portion of the banquet, Mr. Byam, the retiring chairman, expressed his thanks to the local arrangements committee for the way in which they handled all of the numerous details. He then introduced those seated on the dais, including Dr. Farrington Daniels, Dr. Harry L. Fisher, Alden Emery, Walter Murphy, and Dato H. E. McKenzie, a visitor from Malaya.

The presentation of the Charles Goodyear Medal Award was then made to Dr. Blake, with the accomplishments of the medalist being reviewed by James C. Walton (Boston Woven Hose), the incoming chairman, and the certificate, honorarium and medal being presented by Mr. Byam. In his talk, Mr. Walton revealed that Dr. Blake is a true Bostonian, having been born in Boston in 1901, receiving his B. S. degree in Chemical Engineering from Tufts College in 1921 and his doctorate in Organic Chemistry from M.I.T. in 1924. He joined the Simplex Wire & Cable Co. after being graduated, where he has been successively research chemist, director of development and director of research.

Mr. Walton stated that in his college days the medalist was interested in track and basketball and played in the Tufts College band. He still maintains his musical interest by playing the violin and by his fine appreciation of good music. The two major avocations of the medalist are contract bridge and sailing, and he has developed a system for the former which is said to rival that of Culbertson. Mr. Walton also reviewed the various papers prepared by Dr. Blake, particularly the five papers on vulcanization and his current work on soil microorganisms. His co-authorship with C. C. Davis on "The Chemistry and Technology of Rubber" was also recalled.

Amos W. Oakleaf
Treasurer

Charles R. Haynes
Retired Division Secretary

Special Tribute to Haynes

One of the unscheduled events at the banquet was a special tribute paid to Charles R. Haynes, of the Binney & Smith Co., who this year relinquishes the post of secretary of the Rubber Division after having held it since 1946. He was presented with a certificate for a Webcor Electronic Memory Hi-Fidelity Tape Recorder as an expression of appreciation for his work with the Division.

The presentation was made by Howard C. Cramer (Sharples Chemicals) who revealed that not only is Mr. Haynes retiring from the secretaryship but from the

G. R. Cuthbertson
Director-at-Large

Binney & Smith Co. at the end of the year. In reviewing Mr. Haynes' career, the speaker noted that he was born in Dedham, Mass., in 1882, was graduated from M.I.T. in 1904 with a B.S. degree in Chemistry, married Annette Austin in 1915, and first entered the rubber industry in 1904 as a chemist for the old Boston Rubber Shoe Co. He later served with the Boston Woven Hose & Rubber Co., the Mechanical Rubber Co., the Goodyear Metallic Rubber Shoe Co., the U. S. Rubber Co., and since 1935, the Binney & Smith Co.

According to the speaker, Mr. Haynes' principal hobbies are gardening, music and mathematics. He is an accomplished pianist and organist. Those who have worked with him admire him for his congeniality, his agile mind, his dry Yankee wit, his unswerving integrity, his keen appreciation of the cultural aspects of life, and particularly his youthfulness, as reflected by his enthusiasm, optimism and energy. A few anecdotes concerning some of these qualities were related by Dr. Cramer. Special tribute to Mr. Haynes was also paid by Alden Emery in a short talk.

Local Arrangements Committee

Arrangements at the Chicago meeting were especially well handled and thanks are due to the various members of the local arrangements committee, which function under H. Boxser (Acadia Synthetic Products) as chairman and S. Lillis (Victor Mfg.) as vice-chairman. The chairmen of specific activities included the following:

Housing, J. Sheridan (N. J. Zinc) and W. H. Ayscue (DuPont); *Registration*, Maurice O'Connor; *Technical Sessions*, H. A. Winkelmann (Dryden Rubber) and Bruce Hubbard (Ideal Roller); *Banquet*, Francis Frost; *Publicity*, L. W. Heide (Acadia Synthetic Products) and B. Vandermar (Acadia Synthetic Products); *Finance*, A. L. Robinson (Harwick Standard); *Ladies' Program*, J. Groot (Dryden Rubber) and A. Laurence (Phillips Chemical); *Plant Visits*, H. Andersen (Goodrich Chemical) and R. Anschuetz (Witco Chemical); *25-Year Club Luncheon*, H. A. Winkelmann (Dryden Rubber).

DuPont Introduces RPA No. 6

The Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., has announced a new peptizing agent, "RPA No. 6," a free flowing, nondusting powder. According to the company, this chemical plasticizer has been shown by both factory and laboratory tests to be effective in natural rubber and all types of GR-S. The product has a high degree of activity as a chemical plasticizer over a very wide range of temperatures (212 - 350° F.), thus shortening the time required for breakdown. It is said to be very effective in oil-extended GR-S, as well as in both "hot" and "cold" types and in natural rubber. Elastomers which have been plasticized with RPA No. 6 show excellent stability with little change in plasticity during normal storage. It is highly effective in both Banbury and open-mill mastication, DuPont states.

Report from Wetherbee

EDITOR'S NOTE: At the recent meeting of the Rubber Division in Chicago there was a report concerning the welfare of Burt Wetherbee, well-known rubber technologist and purveyor of rubber chemicals, compounding ingredients and machinery and equipment. Checking on the report brought the following reply from the coast:

September 19, 1953

Dear Mel:

I have some idea now of the pleasure with which Mark Twain described reports of his demise as exaggerated. Contrary to the rumors you have heard, I am glad to tell you that I am well, happy and busy. I am still in contact with the rubber industry as a manufacturers' agent here on the West Coast. I hope you can pass along this information to my many friends in the industry whom I greatly miss seeing.

BURT WETHERBEE

114 Vista Circle
Sierra Madre, California

Personnel Changes at Monsanto

Several changes in the sales organization of the Organic Chemicals Division of the Monsanto Chemical Co., were recently announced. Chester W. Christensen, Arthur P. Kroeger and Cyrus W. Merrell, have been named associate general managers of sales, newly-created posts. Tullius C. Tupper and William M. Russell have been appointed as assistant general managers of sales. James A. Singmaster, Jr., has been named New York general branch manager succeeding Mr. Russell. Jack C. Hutchison has been named assistant branch manager at New York succeeding Mr. Singmaster. James J. Feeks has been named branch manager at Cincinnati, Ohio, succeeding Mr. Hutchison. The Plasticizers and Resins Sales Department in St. Louis, Mo., formerly under the managership of Mr. Tupper, has been separated into two departments — plasticizer sales with Howard I. Armstrong as manager and resin materials sales with A. David Evans as manager. Mr. Christensen has been with the company since 1922, and was formerly engaged in sales management capacities in Akron. Mr. Kroeger has been with Monsanto since 1929, and was previously assistant general manager of sales. Mr. Merrell has been with the company since 1935 and was also an assistant general manager of sales. Mr. Tupper has been with the firm since 1933, while Mr. Russell joined Monsanto in 1937. Mr. Singmaster joined the concern in 1944 and had been assistant general branch manager in New York since 1951. Mr. Hutchison joined the firm in 1941, while Mr. Feeks came to Monsanto in 1934. Mr. Armstrong joined the firm in 1942, and Mr. Evans has been with Monsanto since 1941.

Marvinol Metal-Laminate

A method of laminating vinyl plastic and sheet steel or aluminum which will make these metals colorful, decorative and permanently rust and corrosion proof has been developed by the Naugatuck Chemical Division of the U. S. Rubber Co. The process combines the structural strength of metal with the bright colors and exceptional corrosion resistance of vinyl plastic. It promises to be one of the most significant advances for the metals and plastics industries in the last decade, the company believes. Some of the products which can be made from the plastic-metal laminate are decorative and weather-proof building siding, interior paneling, colorful lawn furniture, office and industrial machine housings, inexpensive corrosion resistant containers for chemicals, chemical piping and ducts, truck and trailer body panels, counter tops, shelving and lockers, and office furniture. The process consists of bonding Marvinol, Naugatuck Chemical's vinyl, to sheet steel or aluminum. The resulting laminate, called "Marvinol-Metal Laminate," has a higher abrasion-resistance than varnish, paint and baked enamel finishes. In addition, the bond of the plastic to the metal is so strong that 180 degrees bends and deep draws can be made without separating the vinyl from the metal.

Allied Chemical Buys Plaskon

Arrangements have been completed for the purchase for cash of the Plaskon Division of the Libbey-Owens-Ford Glass Co. by the Allied Chemical & Dye Corp., officers of the two companies recently announced. Plaskon, under Libbey-Owens-Ford management since acquisition of the original properties in 1940, has been successfully developed through an intensive research program into a producer of a wide line of plastic molding compounds and resins having many commercial, industrial and military uses. Of these, the most important are derived from urea-formaldehyde bases. Instead of further expansion of its Plaskon Division, which would now require substantial investment in chemical plant and equipment to produce necessary raw materials, Libbey-Owens-Ford is directing its activities to fields more closely integrated with glass, its major product. Allied Chemical is a producer of basic chemical products used as raw materials and in the manufacture of plastics and synthetic resins. Allied Chemical plans to operate these facilites as a unit of its Barrett Division. The addition of the Plaskon line of products to Barrett's present line of synthetic resins and plasticizers will enable Barrett to provide better service to customers in this field.

Koch Resigns From Witco

Lester J. Koch, vice-president and eastern sales manager for the Witco Chemical Co., New York, N. Y., has resigned from the firm. He will reveal his future plans at an early date. Mr. Koch joined Witco fifteen years ago in the Order Department. He was named export manager in 1945 and then became assistant to the vice-president. He was elected vice-president in 1950 and handled account sales as well as being eastern sales manager.

GOODRICH EXECUTIVE PREDICTS CONTINUING GOOD TIMES IN '54

In contrast to fears of an early recession or depression, forecast in some circles, J. W. Keener, vice-president of the B. F. Goodrich Co., predicts that the United States will enjoy one of the most prosperous years in its history in 1954. The rubber company executive made his prediction of "good times" for the coming year in a recent address before the Fifth Summer Management Conference sponsored by the Institute of Industrial Relations and the Schools of Business Administration and University Extension of the University of California at Yosemite National Park.

Mr. Keener said that in terms of generally accepted economic measurements, 1954 will rank with the second and third best years in the nation's history, although averaging from six to 10% below 1953. The coming year, he believes, will establish an all-time high in the production, distribution and consumption of consumer nondurable goods and services.

According to Mr. Keener, there is little chance of more than a token reduction in the area of government spending, when compared with actual government expenditures in recent years. "Certainly, through 1954, the possible economic consequences of reduced government spending is not a factor of major importance to general business levels," Mr. Keener said.

Discussing possible over-expansion of business, with consequent overproduction and unemployment, Mr. Keener said it is extremely unlikely, in the absence of a monetary collapse, that the nation could have a general condition of industrial over-expansion. He indicated that the real concern could stem from not having sufficient production facilities to supply the increasing population.

Mr. Keener views the 1954 expansion plans of business and industry as a stimulant rather than a depressant. Plant and equipment investment in 1954, according to Mr. Keener, will at least approach the record levels of 25 to 27 billions of dollars expended in 1951-52-53. The need for private investment in plants and equipment, Mr. Keener said, is increasing rather than lessening.

Discusses Inventory Factors

Concerning fears about the size of current inventories, Mr. Keener believes that reduction of inventories to adjust high production levels to current high sales levels—instead of continuing production at levels above present sales requirements—will have no effect on total sales and only minor effects on total production and employment. Mr. Keener said that the price level of the last six months has been almost stationary and he foresees relatively stable prices in the year ahead. On the outlook for prices of farm commodities and their effect on general business, Mr. Keener said:

"Though it is not certain that we have seen the bottom of the current decline, the probabilities are strong that the price decline, now two and one-half years along, is near its end. It is my feeling that the farm price recession is another economic phenomenon that we have seen repeated several times since World War II—a condition under which one or two industries at a time go through their own corrective periods without triggering a general business decline." Reviewing the problem of consumer credit expansion, Mr. Keener said that the rate of expansion has already slowed and will probably stabilize.

"While the level of consumer credit may slightly restrict committments for consumer durables," he said, "high levels of disposable consumer incomes and unprecedented individual savings offer a cushion to offset most, if not all, of the possible decline."

"The consumer credit level appears to hold no danger to 1954 business prospects," Mr. Keener said. "The current and accumulated spending power of consumers as a whole is far more than is necessary to offset any possible slowing that may result from stabilized or curtailed consumer credit expansion."

Auto Rubber Use Rises

A survey by engineers of the Goodyear Tire & Rubber Co. shows that since 1920, designers have increased the number of rubber parts used in the average car from 150 to approximately 540. The total weight of all rubber parts has correspondingly increased from 33 pounds to 100 pounds, excluding the 138 pounds of tires and tubes. Where is all this extra rubber being used? Larger floor mats, seat cushioning material, fresh air heater hose, automatic transmission, power steering and a host of other novel features have increased the total weight of rubber parts by approximately 45 pounds. Extensive use of motor mountings and generally more vibration insulation have accounted for an additional 23 pounds. These hidden comforts are generally given little thought by the average driver and passenger, but they certainly would be conspicuous by their absence. Rubber has played an increasingly important role in the development of the "horseless carriage" since the days when many folks doubted that it would ever replace ole' Dobbin.

Data on Plio-Tuf Resins

The Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio, has made available technical data on its recently introduced "Plio-Tuf" resins. Techni-Guide PT-100-1 concerns itself with Plio-Tuf G75C, a thermoplastic high styrene copolymer resin in the medium hardness range of 72-78 Shore D. Techni-Guide PT-100-2 covers Plio-Tuf G85C and blends with Plio-Tuf G75C. Plio-Tuf G85C is also a thermoplastic high styrene resin in the hardness range of 83-87. Techni-Guide PT-100-3 concerns itself with blends of Plio-Tuf G75C and blends with natural and synthetic rubbers.

KNOWLEDGE INCREASING ON RUBBER STORAGE PROBLEMS

According to recent published reports, the storage of strategic and critical materials in the national stockpile has been going on now for fifteen years or more, though not with the same degree of urgency as in the past five years. Over this period, industry and the government have acquired much valuable knowledge of the lasting qualities of perishables and non-perishables, which might never have been gotten otherwise. The facts are producing some surprises, the most notable of which is in the case of natural rubber.

Rubber is one of the materials being rotated in the stockpile because past experience has shown that it deteriorates slowly in storage. It has been kept under surveillance to determine how long, and under what conditions, the storage life can be lengthened, and to guard against any loss from unexpected deterioration. Some rubber now in the stockpile has been in storage since 1940 and is still in excellent condition. Impurities in rubber, found more generally in the lower grades, apparently contribute to shorter storage life, as do warmer temperatures in the warehouses.

Industry technicians have stated that if rubber could be kept frozen it would keep practically forever. Refrigerating the enormous amount of space required for the rubber stockpile is, of course, out of the question. However, stockpile rubber is stored in areas which have a considerable number of freezing days and under proper warehouse control the hardened mass does not soften sufficiently or long enough to cause deterioration.

No organized test program has been established to determine the maximum storage life of natural rubber. However, it is now the opinion of stockpile rubber inspectors that the higher grades may keep well for at least fifteen years.

Two New Chemigum Rubbers

Two new Chemigum rubbers which are said to have superior color and are in a more adaptable bale size for mill and Banbury use, have been developed by the Chemical Division of the Goodyear Tire & Rubber Co. They have been designated "Chemigum N6" and "Chemigum N7." Company officials pointed out that changes introduced after the new rubber passes through the polymerization process make it almost white in color. Because the polymerization process is unchanged, the new Chemigums are as oil-resistant and as easy to work on the mill as their predecessors. It was explained that the new Chemigums meet long-sought specifications by manufacturers who have been seeking an easier-to-work with rubber while processing it into end products. The low plasticity of Chemigum N6 recommends its use in Banbury mixing and highly loaded stocks. Chemigum N7 is a medium tough rubber designed primarily for molded products. Unusual feature of the new rubbers is that non-sulfur stocks cure rapidly, with little acceleration, to give excellent physical properties and as a result heat resistance properties are very good, the company said.

NEWS IN BRIEF

SE-450 silicone rubber is used by the Acushnet Process Co. in the assembly of a new magnetic compass used by the U. S. Army.

According to a large rubber producer, the life of shaft seals in automatic latex foam machines increases 3 to 6 months with "Ucon" synthetic lubricant in the transmissions.

Krengel Manufacturing Co., New York, N. Y., is producing new stamping dies molded of Vinylite resins. The new stamps are adaptable to any type of marking device, the company states.

"Hazacord" portable cable produced by the Hazard Insulated Wire Works, was used by Twentieth Century-Fox in electrical service for the production of "The Robe".

Some of the world's whitest substances used in the production of paint, Witcarb V and P (precipitated calcium carbonates), are detailed in Technical Service Report P-18 recently issued by the Witco Chemical Co.

Okonite Co., Passaic, N. J., has released a new sound color film, "Underwater Giant," a vivid and technically complete history of the manufacture and laying of a three-quarters of a million pound, world record submarine power cable.

Alrose Chemical Co., Providence, R. I., has made available its 1952 bibliography on "Sequestrene" (ethylenediamine tetraacetic acid), which includes references to a number of interesting articles published in the last year.

Arthur D. Little has made available a new brochure entitled "Product Research" which deals with the development of a new product, improvement of an established product or a method of producing it, discovering new uses for it or a better raw material for it. Ask for Bulletin A.

Wellington Sears Co. has announced the completion of interior modernization and air-conditioning of all six floors of its headquarters building at the corner of Worth and Church Sts. in New York City.

Adhesive Products Corp. has announced the development of a new adhesive, "Cork-Grip," for cementing cork to decorative glass stoppers, making it possible for them to be used as primary seals in decanter-type liquor bottles.

The National Safety Council has just issued a new booklet, "There'll Be a Hot Time in the Ol' Plant," which spells out the whys behind fire rules with a common sense approach which workers will read and believe.

New low prices for the nine different grades of the "Carbowax" polyethylene glycols have been announced by the Carbide and Carbon Chemicals Co. The nine grades affected are Carbowax polyethylene glycol liquids 200, 300, 400, 600, and solids 100, 1500, 1540, 4000, and 6000.

Minnesota Mining & Mfg. Co. and the Gustin-Bacon Mfg. Co. of Kansas City, Mo., have announced an agreement whereby Minnesota Mining has acquired certain Gustin-Bacon patents and inventions relating to the manufacture of glass fiber reinforced plastic pipe.

Brookfield Engineering Laboratories, Inc., Stoughton, Mass., has reprinted a variety of papers and other articles bearing upon viscosity and related subjects. These technical papers have been described and classified in a new "Article Reprint Request Sheet" which is available from the company.

Adhesive Products Corp., New York, N. Y., has announced the development of "No. 3688 Res-Grip Wig Cement," for attaching wigs to plastic dolls made from butyrate, acetate, polystyrene and composition.

A new 52-page technical manual comprehensively covering all elements of V-belt drives, complete with tables, graphs, and diagrams is being offered by the Boston Woven Hose & Rubber Co.

To meet the rapidly increasing demand for dimer acid in a variety of uses, Emery Industries, Inc., has announced an expansion in facilities for producing this long-chain dibasic acid.

"Standards Are Your Business," a 24-page booklet defining standards of production and their value as tools of management, appears in a new, revised edition just issued by the American Standards Association to emphasize the economic importance of standardization.

"Effect of Carbon Black on Water Absorption of Neoprene and Buna N Compounds," is the title of a new Technical Service Laboratory Bulletin recently issued by Godfrey L. Cabot, Inc., Cambridge, Mass. Ask for GD-5.

An improved line of Class H fiberglas tubing and sleeving produced by the Bentley, Harris Mfg. Co. of Conshohocken, Penna., utilizes SE-100 silicone rubber coating compound.

Synthetic rubber insulation now replaces fiber in brush mechanisms on the entire line of direct-current equipment manufactured by the Specialty Motor Sub-Department of the General Electric Co.

New Harwick Materials

Harwick Standard Chemical Co., Akron, Ohio, has announced the availability of three new materials. The first of these, "Rubber Lubricant No. 5," is used as an extrusion dip to prevent shapes from sticking together in the cure; it is also used as a slab dip, mandrel lubrication and whenever a non-pigmented anti-stick agent is required. This material is available as a glycerine soap in a 20% concentration amber clear liquid, and in a 40% concentration paste. Rubber Lubricant No. 5 is said to leave a shiny pleasing finish on the rubber and will not spot. It is non-irritating to the skin. "Rubber Lubricant No. 80" is an 80% potassium soap of refined and fractionated tall oil. It is an amber paste of light consistency and will not jell at concentrations as high as 20%. It is non-hydroscopic. It performs well as a suspending agent in pigment water dispersions. This material is used in compounding slab dip and bag lubricants. The third of the new materials, prepared "Slab-Dip," has pigments, soaps and synthetics in semi-fluid dispersion. Total solids are 55%. This material is a thick white fluid which is uniform, clean, easily handled and which eliminates the need for stocking and mixing a variety of pigments and soaps. The strength of the solution is easily controlled by direct titration. Slab-Dip may be measured directly by volume in a pail or drum since it will pour. It may also be used in bag lubricant formulations, the company states.

Arthur D. Little, Inc., Cambridge, Mass., has announced plans to open a new midwest liaison office in the Board of Trade Building, Chicago, Ill.

Crystal Research Laboratories, Inc., Hartford, Conn., is producing a new flexible bottle-filter water softener made of Bakelite polyethylene. The 32-ounce bottle with ion-exchange filter attached, produces a continuous stream of demineralized water for use by service stations in auto batteries.

The latest information obtained from application research in the field of using polyurethanes as adhesives for bonding rigid materials, such as metal-to-metal or glass-to-glass, is contained in a technical bulletin recently made available by the Phosphate Division of the Monsanto Chemical Co.

Many of the complexities of grinding wheel practice, a long-standing problem for that industry, have now been eliminated with the publication of a new simplified net pricing schedule by U. S. Rubber.

Goodyear has announced that its new soling material, "Crown Neolite," produced with millions of tiny cells, is so light that it floats in water, yet it is waterproof.

An index to Volume 73 of RUBBER AGE will be found on Pages 159 to 162 of this issue.

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So. Ohio Holds Fall Meeting

Approximately 100 members and guests of the Southern Ohio Rubber Group attended the Fall Meeting held on September 17 at the Engineers Club in Dayton, Ohio. Principal speaker at the meeting was Kenton W. Zahrt, chief of the Tire Section, Aircraft Laboratory of the Wright Air Development Center. Mr. Zahrt spoke on the "USAF Tire Development Program." He spoke at some length on this subject and presented a sound motion picture showing the effect on tires of high speed landings, and dynamometer tests on tires at 65° and 575° F. Colonel M. E. Sorte, chief of the Materials Laboratory at the Wright Air Development Center, spoke of the development of the center and showed a documentary film covering this program. Earle F. Bartholomew, project engineer of the Rubber and Plastics Division of the Wright Air Development Center, acted as meeting chairman.

To Sell Foam Rubber Abroad

Hewitt-Robins Inc., Stamford, Conn., has announced plans to introduce its foam rubber products in South America and other foreign markets. At the present time the company's foam rubber production is sold almost entirely in the United States. The chief products are cushioning for the automobile and furniture industries and pillows for the bedding industry. Some other products, such as conveyor machinery, industrial hose and belting have been sold in foreign markets for many years. The decision to export foam rubber was made following a survey which showed that a good market for foam exists in a number of foreign countries that now lack a suitable source of supply.

To Address Akron Council

Dr. A. V. Astin, director of the National Bureau of Standards, will be the principal speaker at the annual dinner meeting held by the Akron Council of Engineering and Scientific Societies at the Mayflower Hotel in Akron, Ohio, on October 28. The Akron Council represents societies with a total membership of approximately 2,000 technical and professional men. Further information about the meeting may be secured from the chairman of the Banquet Committee, D. F. Behney, c/o the Harwick Standard Chemical Co., 60 S. Seiberling St., Akron, Ohio.

No. Calif. Holds Barbecue

The Northern California Rubber Group held its Annual "Good Times" Barbecue on September 19 at the Adobe Creek Lodge, Los Altos, Calif. The barbecue, an all-day event, was attended by approximately 135 members, their wives, children and guests. Activities included softball, volley ball, swimming events, horseshoes and special events for the children. The Barbecue Committee consisted of Halsey Burke (Burke Rubber), John Elwood (Monsanto), Bill Deis (Goodyear Rubber), Gene Gador (Oliver Tire), and Ruth Hatch (Mansfield Rubber).

Coming Events in the Rubber Industry

Oct. 23. Akron Rubber Group, Mayflower Hotel, Akron, Ohio.

Nov. 6. Chicago Rubber Group, Fall Meeting, Furniture Mart, Chicago, Ill.

Nov. 10. Los Angeles Rubber Group, Hotel Statler, Los Angeles, Calif.

Nov. 13. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Nov. 18. Washington Rubber Group, Washington, D. C.

Nov. 19. Rhode Island Rubber Club, Metocomet Golf Club, East Providence, R. I.

Nov. 19-20. Chemical Institute of Canada, 5th Canadian High Polymer Forum, London Library and Museum, London, Ont., Canada. (Sponsored jointly with National Research Council of Canada).

Nov. 29-Dec. 4. A. S. M. E. Annual Meeting, Hotels McAlpin and Statler, New York, N. Y.

Dec. 3. Fort Wayne Rubber & Plastics Group, Hotel Van Orman, Fort Wayne, Ind.

Dec. 3-4. Society of the Plastics Industry, Fifth Film, Sheeting and Coated Fabrics Division Conference, Commodore Hotel, New York, N. Y.

Dec. 11 Boston Rubber Group, Xmas Party, Hotel Somerset, Boston, Mass.

Dec. 11. Detroit Rubber and Plastics Group, Xmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 11. New York Rubber Group, Xmas Party, Henry Hudson Hotel, New York, N. Y.

Dec. 12. So. Ohio Rubber Group, Xmas Party, Miami Valley Country Club, Dayton, Ohio.

Dec. 15. Buffalo Rubber Group, Xmas Party.

Dec. 18. Chicago Rubber Group, Xmas Party, Morrison Hotel, Chicago, Ill.

Jan. 24, 1954. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Jan. 27-29, 1954. Society of Plastics Engineers, Inc., Tenth Annual National Technical Conference, Royal York Hotel, Toronto, Ont., Canada.

Jan. 29, 1954. Akron Rubber Group, Winter Meeting, Mayflower Hotel, Akron, Ohio.

Feb. 5, 1954. Chicago Rubber Group, Congress Hotel, Chicago, Ill.

Feb. 11, 1954. Fort Wayne Rubber & Plastics Group, Hotel Van Orman, Fort Wayne, Ind.

Mar. 26, 1954. Chicago Rubber Group, Furniture Mart, Chicago, Ill.

Apr. 2, 1954. Akron Rubber Group, Spring Meeting, Mayflower Hotel, Akron, Ohio.

Apr. 8, 1954. Fort Wayne Rubber & Plastics Group, Hotel Van Orman, Fort Wayne, Ind.

Apr. 14-16, 1954. Rubber Division, A.C.S., Spring Meeting, Hotel Brown, Louisville, Ky.

Apr. 30, 1954. Chicago Rubber Group, Furniture Mart, Chicago, Ill.

June 18, 1954. Akron Rubber Group, Summer Outing.

June 22-25, 1954. Institution of the Rubber Industry, Third Rubber Technology Conference, London, England.

Sept. 15-17, 1954. Rubber Division, A.C.S., Fall Meeting, Hotel Commodore, New York, N. Y.

Polymethoxy Acetals Available

A series of polymethoxy acetals of varying viscosities is now being offered in semi-commercial quantities by the General Aniline & Film Corp. The PMACs are mixed long-chain methoxy acetals miscible with a wide variety of organic liquids and compatible with water insoluble plasticizers. These properties suggest their use as plasticizers and softeners, high boiling solvents, resin modifiers, etc.

Gottscho Silver Printing Ink

A new silver ink which is said to have exceptional brightness and opacity and which has been designed to afford greater contrast when printed on black and other dark materials, has been introduced by Adolph Gottscho, Inc., Hillside, N. J. Among the products on which the new silver ink has been used successfully are slab rubber, sponge rubber, plastic sheet material, and rubber-impregnated twill fabrics.

McIntyre Promotion Announced

R. E. McIntyre

Promotion of R. E. McIntyre to executive vice-president of the Standard Products Co., Cleveland, Ohio, was recently announced. Mr. McIntyre also is a member of the board of directors, as well as treasurer of the company. He joined Standard Products 10 years ago as assistant to the treasurer, and has been its chief financial officer for the past five years. A 1931 graduate of the University of Detroit, Mr. McIntyre is a native of Saginaw, Michigan, and served for 10 years with the Chevrolet Division of General Motors in Saginaw and Detroit, before joining Standard Products.

Goodrich Offers New Compounds

Development of new unvulcanized crude rubber printing compounds that eliminate sulfur bloom and increase plate life has been announced by the B. F. Goodrich Co. Company officials stated that the new compounds are the first non-blooming printing compounds ever developed. It was said that they are designed for use in Flexographic printing and other letterpress applications. Blooming occurs when free sulfur comes to the surface of the rubber, usually during storage, and forms hard spots and pits on the printing plates. The new compounds, according to the company, can be stored either at room temperatures or under refrigeration for long periods without danger of bloom. Four years of research and testing show that plates made with the new compounds remain sharp and ready for immediate use after extended periods of storage.

Review of ASTM Research

The American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna., has made available reprinted copies of the "Review of ASTM Research" as published in the December, 1952 and January and February, 1953, *ASTM Bulletins*. This material, prepared by the ASTM Administrative Committee on Research, summarizes the work of the various technical committees of the society as of May, 1953. Of particular interest is the summary provided on the work of Committee D-11 on Rubber and Rubberlike Materials.

New Colloidal Graphite Dispersion

Acheson Colloids Co., Port Huron, Mich., a division of Acheson Industries, Inc., has announced the development and marketing of a new colloidal graphite dispersion known as "Glydag B." It is colloidal graphite dispersed in 1,3-butylene glycol, used as a source of colloidal graphite in rubber-lubricant formulations. The greatest volume of rubber lubricants is required in the automobile industry. Shock absorbers, tie rods, steering assemblies, stabilizers, and other important parts of the modern automobile have tight-fitting rubber bushings requiring a penetrating rubber lubricant to eliminate squeals between the rubber and metal friction surfaces. Low-viscosity fluid formulations containing Glydag B are ideal for this purpose, since colloidal graphite from the Glydag will furnish residual lubrication long after the liquid has dried out or been washed away, the company states. Molded rubber "bearings" in certain reciprocating assemblies of automobiles are naturally porous, and are generally impregnated with graphite during manufacture. Relubrication with a product containing Glydag B will restore the original free action to such parts, according to the firm. Similar applications on such items as motor-scooters, materials-handling vehicles, and washing machines offer other important areas for the use of colloidal graphite in rubber lubricants.

Reports on Safety Program

A modernized safety and industrial health program initiated two years ago by the United Engineering & Foundry Co. at its plant in New Castle, Penna., has not had the chance, in the conservative opinion of plant management, to prove its effectiveness. One concrete fact, however, stands out in plant health records: there has not been a single new case of silicosis in these first two years. The dusts inherent in foundry work are an ever-present factor to be reckoned with in safeguarding health of personnel. The company attacked the problem in various ways at once. First, a modern ventilation system was installed and is meticulously maintained and periodically checked for efficiency. Respirators were provided for all personnel wherever there was at least a doubt as to their need. A comprehensive medical and health procedure was also initiated. Employee reaction to the program has been excellent, company officials noted.

Promoted by Phillips Chemical

R. E. Elliott, associated with the Phillips Chemical Co. since 1948, has been appointed assistant to R. J. "Grady" Hull, Philblack export sales manager in New York, N. Y. Mr. Elliott was graduated from the University of Kansas with an AB degree in chemistry and was first employed by the company as a chemist at Bartlesville, Okla. He was transferred to Akron as office manager in November, 1949, and was made a technical sales representative in December, 1951. R. N. Hendriksen, who recently joined the company as a technical sales representative, has assumed Mr. Elliott's former duties.

Berger Joins Dee's Adhesives

Harold D. Berger

Harold D. Berger has been appointed technical sales representative for latex compounds by Dee's Adhesives & Chemicals of Lynn, Mass. His office will be at 30 Eastwood Lane, Valley Stream, N. Y., and he will service New York, New Jersey, Pennsylvania and Connecticut. Mr. Berger was associated with Stein-Hall Co. as chief chemist for the past five years. Previous to that, from 1939 to 1948, he was with the Rubber Corp. of America as latex chemist.

NBS Rubber Publications

The National Bureau of Standards of the U. S. Department of Commerce, Washington, D. C., has released a list of 276 publications pertaining to rubber by members of its staff. The listing, prepared by Lawrence A. Wood, is intended to cover the period from the founding of the Bureau to June 30, 1953. Some of the publications in the list have appeared in the regular series of publications of the Bureau and others in various scientific journals and books. Subjects covered in the listing include natural rubber, production, evaluation and testing; synthetic rubbers, production and testing; latex; polymerization and purification of rubbers; crystallization and other transitions in rubber; constants and properties of rubber; chemical reactions of rubber; constants and properties of monomers and other materials related to rubber; chemical analysis of rubber; physical testing of rubber; rubber products; specifications and standards for rubber products, and general information.

Fire-Retardant Wall Paint

Fyr-Kote Co., a division of the Morris Paint & Varnish Co., Omaha, Nebr., has introduced a new oil-base fire retardant interior flat wall paint which has been listed by Underwriters Laboratories. Called "Fyr-Kote," the paint is said to be extremely washable, withstanding more than 25 cycles of scrubbing with strong washing powder and boiling water. When exposed to fire, the paint pours out carbon dioxide and calcium chloride which smothers fire and retards the spread of flame right on the surface.

McCullough Joins Calco Chemical

R. W. McCullough

Appointment of R. W. McCullough as technical field service representative to the rubber compounding industry was recently announced by the Intermediate and Rubber Chemicals Department of the Calco Chemical Division, American Cyanamid Co. Mr. McCullough comes to Calco with a wide background of experience in rubber manufacture. He obtained his B.S. degree in chemical engineering in 1935 and joined the Firestone Tire & Rubber Co., where he served as an analytical chemist and later as chief chemist in the company's South African operations. In 1950 he became Cleveland area sales representative for the Industrial Chemicals Division of American Cyanamid Co. and since 1952, for the Arizona Chemical Co., a subsidiary of the parent company.

Bakelite Promotes Eversole

Dr. James F. Eversole has been appointed vice-president in charge of research of the Bakelite Co., a division of the Union Carbide and Carbon Corp. Dr. Eversole joined Union Carbide in the research organization of the Carbide and Carbon Chemicals Co. as a research chemist in 1929. Several years later, he was assigned to the laboratories of the Linde Air Products Co., another division of Union Carbide. In 1943, Dr. Eversole was appointed superintendent of Linde's laboratories at Tonawanda, N. Y., a position he held until 1951. At that time, he moved to New York to become manager of research administration of Union Carbide, in which capacity he was responsible for coordination of research activities of all the corporation laboratories where basic research and development work is being done on alloys, chemicals, gases, carbons, and plastics.

O'Sullivan Issue Placed

A $600,000 issue of O'Sullivan Rubber Corporation's 5% first mortgage bonds due serially to November 1, 1965, has been sold privately, the company recently announced. Proceeds will be used to pre-pay long-term debt, increase working capital and expedite the three-year $900,000 expansion and improvement program the company started last summer.

Hood Safety Seal 400 Tire

A tire that needs no tube and protects against the three major road hazards of punctures, blowouts, and skids has been announced by the Hood Rubber Co., a division of the B. F. Goodrich Co. Called the Hood Safety-Seal "400", the all-new tire features four traction center bars which act like windshield wipers to clear away slick road film and provide a dry-wiped surface for fast acceleration and resistance to sideslip. Molded into the four outside ribs are hundreds of "Safety Grip Blocks". When brakes are applied, extra bitting edges dig through road film and clear away water to make stops quick and sure, the company states. The safety grip blocks and center bars are scientifically sized and spaced to overcome road noise and hum and assure quiet running. Deep, well-vented shoulders help keep the tire cool, and flex evenly for smoother riding.

Built with a wider tread than conventional tires, the Safety-Seal "400" tubeless tire puts more rubber on the road. Center of the tread is also flatter to reduce natural scuffing and give extra mileage. The Safety-Seal "400" has a layer of special gummy rubber under the tread area that seals around a puncturing object, preventing loss of air. When the puncturing object is removed, this pliable compound seals the hole instantly and permanently, thus preventing a flat tire.

Another feature of the all-new tire is the patented "Blowout Shield" that protects against dangerous blowouts caused by bruises. The Blowout Shield—a double liner of synthetic rubber—extends over the entire inside of the tire, from bead to bead, and is permanently bonded to the cord body. In combination with "Rim Seal" ridges, the blowout shield keeps air inside the tire without the use of a tube and the tire stays properly inflated longer. The Hood Safety-Seal "400" puncture-sealing tubeless tire is available in both black sidewalls and combination black-and-white sidewalls in a full range of low pressure sizes.

U. S. Rubber Stockholders

The number of holders of common stock of U. S. Rubber Co. on June 30, 1953, totalled 22,859, a gain of 1,511 or 7% in the first half of 1953, the company recently announced. The increase continues a long term trend toward broader sharing in ownership of the company. In 1938 common stockholders numbered only 9,871. By 1943 they had increased to 12,462, and by 1948 to 15,410. Thus since 1938, the increase has been at the rate of 26% in the first five years, 24% in the second and 48% in the last 4½ years. Most rapid increase has been since January 1952, when the company first announced a forthcoming split of the common stock. In the 18 months since then the number holding the common stock has increased 6,497 or 39% over the 16,362 on record at the end of 1951. This gain was equivalent to the gain in the previous 13 years. U. S. Rubber's preferred stockholders numbered 9,702 on June 30 (53 less than six months before), bringing to 32,561 the combined total of common and preferred stockholders.

Tisser Joins Federal Latex

Samuel Tisser

Federal Latex Corp., Brooklyn, N. Y., has announced that Samuel Tisser has joined the company as a principal. He will serve in the capacity of general manager and assistant vice-president in charge of technical sales and service. Mr. Tisser, who is widely known both for his technical know-how as well as sales ability, was until recently associated with the Heveatex Corp., Melrose, Mass. He will direct a staff of latex technologists and will serve the needs of consumers with a complete range of latex compounds. Equipment and facilities are being expanded to meet increased demands.

Reaches Billion Dollar Level

Phillips Petroleum Co. of Bartlesville, Okla., recently became the 30th corporation in American industry with total assets in excess of $1,000,000,000. The company's 36-year stretch to the billion dollar level is the shortest time required by any oil company not having predecessor companies with large, integrated operations. Phillips has grown faster than any of them and faster than any other billion dollar company in the last ten years, when assets increased nearly four-fold. In the past five years alone, the company has more than doubled its size. The company's income and earnings have more than kept pace with asset growth. For 1952, both gross and net income were over five times greater than the figure ten years earlier. Per share earnings rose from $1.48 to $5.17, while the current dividend rate of $2.60 compares with $1.00 in 1942, both adjusted for a 1951 two-for-one stock split.

Constructing New Plant

The Rway Synthetic Products Division of the Reiss Manufacturing Corp., New York, N. Y., is constructing a new factory building in Little Falls, N. J. Scheduled to be ready for occupancy in early 1954, the plant will provide 30,000 square feet of floor space to house new production facilities for silicone rubber extrusions, sheets and molded goods, a laboratory and a completely equipped tool, die and production machine shop. Charles S. Powell is manager of the division and F. X. Kuhlmann is chief chemist.

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A Word About the Author—

Dr. Royce J. Noble is a well-known consulting chemical engineer and an outstanding expert on latex. He has been intimately associated with latex technology for the past 30 years and has served with one of the leading suppliers of latex compounds and compositions in a technical and executive capacity. During World War II he was associated with the Chemical Warfare Service as a Colonel engaged in both rubber and latex problems. He is eminently qualified as the author of this comprehensive text bok on latex and its applications.

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USES FOR RUBBER IN RAILWAYS DISCUSSED AT CONFERENCE IN MUNICH

On September 1st, 238 representatives of Western European railway companies and rubber and machine industries met at Munich, Germany, to attend a conference on new rubber uses for railways. The conference was organized by the Rubber-Stichting's branch office at Frankfurt, das Internationale Kautschukburo, Sektion Deutschland, on the occasion of the International Traffic Exhibition. Railway experts and rubber technologists from Germany and France explained the significance of rubber appliances for the construction of rolling stock and railway track.

The use of rubber for coach building was the subject of lectures delivered by Dr. Mielich, director of the German Railways and Drs. Taschinger, Hogenrath and Wagner. It was disclosed at these lectures that for the suspension of the bogies of German railway carriages, which measure 26.4 meters in length, "Silentbloc" anti-vibration units are used. The well-known concertinas of leather or canvas for coach connections are nowadays replaced by a system of heavy rubber units which are squeezed together when the carriages are coupled. As a result, a draft proof and sound-deadening connection is obtained, which increases the comfort of passengers. All seats are upholstered with "Hairlok", a material manufactured from animal hair or vegetable fiber and latex.

"Silentbloc" units are being increasingly used in locomotive-engine construction, especially for the bearings of driven axles and the driving and guiding of the bogies. Moving parts are mounted where possible with rubber in order to decrease to a minimum the number of lubrication points.

Uses in Power Transmission

Dr. Kloss of Siemens Schukert paid special attention to the use of rubber for the transmission of power to the driving axles. Rubber couplings ensure an elastic connection with the result that vibrations of the engine are not transmitted to the coachwork. Dr. Berg, Bochumer Verein A. G., outlined the principle and the advantages of railway wheels that are elastically mounted to the axles by using rubber.

Dr. Weber, director of Metallgummi T. B., Hamburg, discussed the physical properties of rubber used for the mounting of engines and elastic couplings for the transmission of torsional moment, axle and bogie suspensions. Finally, two very important subjects were dealt with, i.e., the use of rubber for the elastic fastening of rails and the development of the pneumatic tire for railways and underground trains.

Dr. Meier, section president of the German Railways, treated the first subject. He pointed out that welding of long-length rails is coming more into practice. This technique requires special provisions concerning the fastening of the rails in order to neutralize the pressures caused by temperature fluctuations. To meet these difficulties wooden sleepers are often replaced by concrete ones; these, however, lack the necessary elasticity to deaden the vibrations caused by moving trains. This difficulty can be removed by applying rubber pads underneath the rails.

The rubber rail pads are fastened with bolts and elastic rings, or, according to the French system, with an elastic steel clip, which press the flange of the rail on the sleeper. 1,500 kilometers of track are now provided with rubber pads, mainly on straight stretches and slight curves. After two years of service about three million rail pads in use on these stretches are still in excellent condition.

Pneumatic Railway Tire

Dr. Biehler of Paris described the development of the pneumatic tire in railway traffic, a project commenced by the Michelin Brothers in 1929. In 1936 Michelin constructed the so called "metallic" tire, in which the cotton cords were replaced by layers of thin steel wire, resulting in a tire capable of carrying much higher loads. At the same time, the French constructors proceeded to build light railway coaches, equipped with five-axle bogies. Thus other wheels could take over the load in the event of failure of one of the tires. This new rolling stock is still in excellent condition as can be seen from the trains on the Paris-Strasbourg line.

A new system, dispensing with the use of normal railway track has also been developed in recent years for the Paris subway. The bogies of the carriages are provided with two axles to which steel flange-wheels and a rim of the lorry type are fixed. The wheels are equipped with pneumatic tires of a larger size than the flange-wheels, therefore the load of the carriage is normally carried by the tires, which move along a concrete track.

The bogie on each side is guided by two sets of horizontal rubber-tired wheels, both resting on current-conducting side rails. Thus the vertical flange-wheels, fitted next to the tires, are running idle but they take over the load as soon as the tire in question deflates. In 1951, a test stretch of 800 meters was constructed using this system. The results are satisfactory since the train has been in service on this track for over 40,000 kilometers without any failure, and the wear of the tires is practically nil, the report stated.

Russian Rubber Research Reports

Two reports covering recent Russian research on rubber which were originally published in the *Colloid Journal (USSR)*, 1952, are available in complete English translation, at $7.50 each report, from the Consultants Bureau, 152 West 42nd Street, New York 18, N. Y., as follows:

"Variation of the Rheological and Adhesive Properties of Solutions of Rubber with Degree of Mastication", by M. P. Volarovich and L. Ya. Ginsburg.

"Changes in the Mechanical Properties of Vulcanizates in the Early Stages of Thermal Oxidation", by A. S. Kuzminsky and L. I. Lyubchanskaya.

An index to Volume 73 of RUBBER AGE will be found on Pages 159 to 162 of this issue.

Develops New Racing Tire

A new racing tire proved capable of withstanding the extreme heat and violent stresses on wheels of America's fastest race cars at the Bonneville, Utah, salt beds has been developed by the Firestone Tire & Rubber Co. Featuring high-abrasive and heat-resisting tread and body compounds, developed for the 500-mile Indianapolis Race Classic and for jet aircraft at Wright Field, the new racing tires were designed to meet every condition on the raceway. The tires have a new low tread contact area to provide minimum rolling resistance. The tread is vented on both sides of the shoulder to reduce the tread weight and provide cooler running.

In addition to the tires, newly-designed heat-resistant inner tubes, constructed with heavy base gauge rubber, contributed to the high-speed performance of the tires. The new tubes reduced heat transfer from the brake and wheel assemblies to the tires when operated at extreme speeds. The new tubes were also equipped with special reinforced metal stems which were threaded from the base. The stems were locked into position by a hex nut and insulated with leather washers. The new stem assemblies permitted secure attachment to the rims and prevented the valves from being drawn through the rims by centrifugal force at high speed.

Building New Development Plant

Construction of a plastics development plant at the site of the large Kobuta, Penna., chemical plant of the Chemical Division of the Koppers Co., Inc., was recently announced. According to the company, the new facilities will produce semi-commercial quantities of a wide variety of new plastics. These compounds result from an extensive research program conducted by Koppers over the past several years, and will be available for application to various industrial and consumer goods needs in the plastics field. The plant will be able to produce several new products in quantities sufficient to satisfy preliminary commercial orders. Design and erection of the new facilities will be done by the Chemical and Gas Department of Koppers Engineering and Construction Division which built the original Kobuta installation for the government during World War II and additional facilities for Koppers on the site in recent years.

Deodall No. 1 Deodorant

Sindar Corp., New York, N. Y., has announced the development of a new all-purpose, inexpensive deodorant to be sold under the tradename "Deodall No. 1". The product is not intended for one particular odor problem, but is recommended for use in various industrial odor applications where only an inexpensive masking agent can be used. Deodall No. 1, therefore, is said to open a completely new area of odor application in such products as low-cost solvents, chemical by-products and salvagable materials which can be made salable only with the application of an inexpensive deodorant. Deodall No. 1 is available not only in drum quantities but in lots up to and including tank cars.

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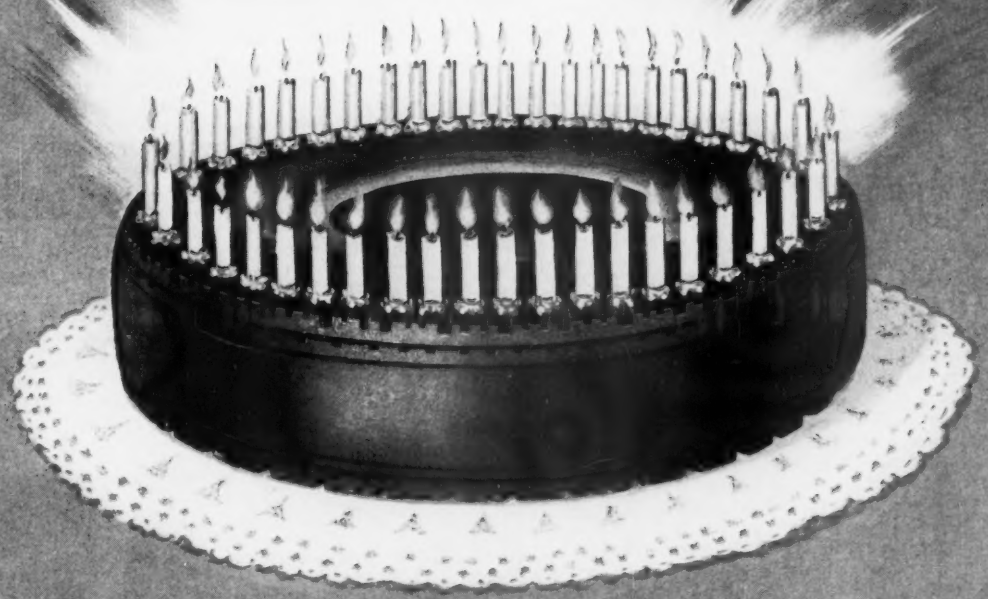

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HIGHER TENACITY TIRE CORDS SEEN IN NEW RAYONIER DEVELOPMENT

A new and improved type of cellulose which has been developed especially for use in high stretch rayon spinning techniques, has been introduced by Rayonier, Inc., New York, N. Y. This product, coupled with the new spinning techniques, holds strong promises for revitalizing and expanding the manufacture and use of rayon yarn and staple for tire cord, fabrics, and wide textile applications, the company believes. High-tenacity rayon yarn for tire cord with strengths superior to those in current use, and staple fiber and yarn for viscose rayon fabrics with characteristics far surpassing those of today, are now said to be possible with the new cellulose.

The new product, "Rayocord-X," is said to be one of the major single achievements since wood became the chief source of cellulose some 25 years ago. The new cellulose, according to Rayonier, holds highest hopes not only for tire cord production but importantly for the rayon industry, as fabric produced from this newly developed fiber will possess tenacity and washability superior to those currently manufactured.

Resulting from nearly a quarter century of continuing research, Rayocord-X is described as a high alpha cellulose made by the sulfite process, a cellulose composed of chains of uniform length such that, in high stretch viscose spinning, the chains may be formed in a highly ordered pattern. This imparts high strength, resistance, and toughness to the filaments thus regenerated from solution. Theoretical calculations have predicted such high strengths through orientation and, in fact, strengths far beyond these, but commercial realization has only recently appeared possible.

Cites Advantages

Dr. Arthur N. Parrett, Rayonier's vice-president in charge of research, said that the new sulfite cellulose, when employed with new spinning techniques in the manufacture of rayon yarn for textiles and high tenacity tire cord, will result in products possessing high fatigue life, high strength, toughness, and resistance to laundering.

Dr. Parrett observed that to the layman it might not appear impressive that tire cord strengths can be increased to over 3 grams per denier after the twisting of yarns into cord. But the added strength is "indeed impressive," one that was made possible by the unusual physical structure of cellulose molecules leading to uniform distribution and paralleled orientation in high stretch spinning processes.

It was explained that this new cellulose makes it possible to stretch the filament 100% and more during the spinning process. Conventional rayon fibers during the spinning phase are normally stretched only 30% for textile yarns and up to 60% for tire cord yarns. He added that Rayonier has demonstrated such results in its own rayon pilot plant by using high stretch spinning techniques.

The high stretch process permits drawing cellulose chains into a highly oriented, crystalline structure throughout the entire filament cross section. Conventional rayons of today have this effect only as an outer skin of the filaments, the core being unoriented, amorphous celluose lacking in strength and durability. It is impractical to apply extreme stretch using a viscose prepared from cellulose of uneven polymolecularity.

Tests conducted by the Rayonier Research Division are said to reveal that tire cords manufactured from Rayocord-X by high stretch spinning techniques have proved fully competitive in quality with cords produced from blends of cotton linters and other wood cellulose types. The new Rayonier fiber is considered by the company to be a complete and more economical replacement of these blended cellulosics. Tires built of cord produced from Rayocord-X should possess greater resistance to fatigue and shock because of the advantage gained from the use of this new basic raw material in advanced spinning techniques.

Superior Cellulose Qualities

Laboratory tests have convinced Rayonier researchers that the new fiber possesses cellulose qualities superior to any other product commercially available, and that Rayonier's sulfite facilities are sufficiently large to produce quantities commensurate with industrial needs both here and abroad. It was noted that the company's new mill, currently in construction at Jesup, Georgia, will also produce a high quality cellulose especially suitable for the new developments in tire cord, rayon, and staple fiber.

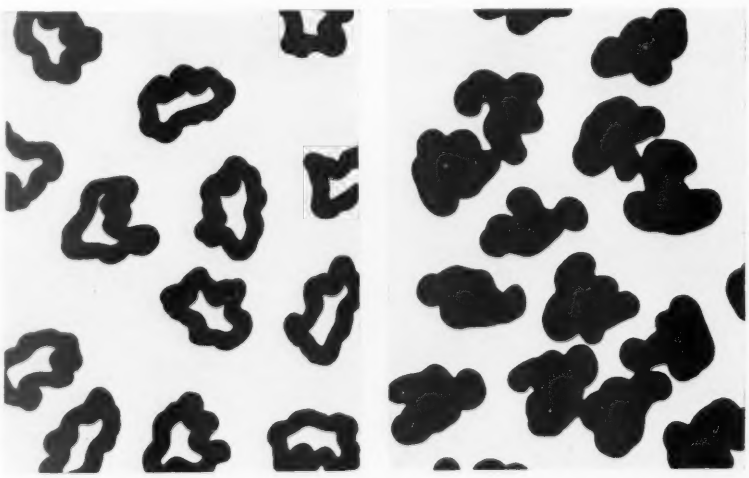
Dr. Parrett pointed out that cellulose from trees, the basic raw material not only for rayon and tire cord, but for acetate, cellophane, film, lacquers, and a host of useful products, is readily and cheaply available. "It is a replenishible raw material and its benefits to man, while numerous, will undoubtedly be increased as research and development continue and more people throughout the world come to use more cellulose as living standards and quality standards rise."

Calculations, previously mentioned, have indicated that strength characteristics far above anything yet achieved are theoretically possible in regenerated cellulose filaments. These calculations range as high as 15 grams per denier, a degree of strength almost unknown in any type of material. With such an ultimate goal in sight Rayonier's job is to develop and be ready to supply new forms of cellulose for new products and new requirements.

Calco Chemical Promotes Loosli

Alden R. Loosli has been named manager of the newly formed Market Research and Development Department at the Calco Chemical Division of the American Cyanamid Co. in Bound Brook, N. J. Mr. Loosli will also continue in his present post of assistant to the general manager. The new department, which will include the existing Market Research Department, will conduct market surveys and make economic studies for new products, and promote initial sales of new products requiring market exploration. Wiley W. Carr will continue in his position of manager of the market research section of the new department.

Mr. Loosli, a native of Marysville, Idaho, attended the University of Idaho and the University of Chicago where he obtained his B.S. degree in physical sciences. He came to Calco in 1937 as a student trainee and has held supervisory positions in various production departments. After a period of sales training he was appointed assistant sales manager of the Rubber Chemicals Department in 1947. In 1950, he was named assistant manager of the Intermediate and Rubber Chemicals Department when they consolidated. In January of this year, he was made assistant to the general manager. He is a graduate of the Advanced Management Program of the Harvard Graduate School of Business Administration, a member of the American Institute of Chemical Engineers, American Chemical Society, the Society for the Advancement of Management, and the American Management Assn.



Shown above is a cross section magnification of a conventional medium-skin tire cord (left) and Rayocord-X (right). Both have been magnified 2200 times.

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BRITISH GROUP ISSUES REPORT ON SAFETY PRACTICES IN MILL OPERATION

In June, 1952, British manufacturers of two-roll mills met informally to consider a report issued by the National Joint Industry Council for the Rubber Manufacturing Industry on "Safe Working on Horizontal Two-Roll Mills". The manufacturers were invited to sit as a No. 1 Mill Committee under the auspices of the NJIC. The first meeting of the No. 1 Mill Committee was held on September 11, 1952, and resulted in the establishment of procedure for two-roll mill operation. The Committee agreed on the specifications for the equipment of all new mills having rolls 16 inch diameter and upwards and supplied for use in the home market. The report states that the mill will be equipped with a brake, and with a sensitive safety bar and fixed guard front and back, as follows:

(1) *Brake*—the brake will be operated by pressure on the sensitive bar to bring the front roll to rest in not more than ⅛ of a revolution from the operation of the bar.

(2) *Sensitive Safety Bar* — this will function in the manner described in this report and will consist of a horizontal rigid bar permanently secured at each end to suspension arms. Each suspension arm will be carried in ball or roller bearings. The sensitive bar will be loaded by weights permanently secured to give a total horizontal loading to the bar of about 40 pounds. The construction of bar suspension arms and weights will be such as to eliminate any possibility of relative movement between the parts. (If it is desired that the sensitive bar should rotate, a loose sleeve will be mounted on a bar not less rigid than that specified above).

Movement of not more than ½ inch of the sensitive bar will cause the operating switch or switches to cut off power from the driving motor and simultaneously apply the brake. The switches will be rigidly secured and located on the mill frame. Stops will be provided to limit movement of the sensitive bar in either direction. The inward stop will be positioned so that the striker(s) cannot overrun the switch(es).

Bar Position Defined

The position of the bar relative to the fixed guard will be such as to prevent as far as possible, material or hands, etc., entering the space between the bar and the fixed guard so as to interfer with the bar movement. Switches and strikers will be protected against possible damage or interference by stock in the machine.

(3) A fixed and rigid guard will extend from the sensitive safety bar to the machine tray or its equivalent which will: (a) prevent access under the bar, and (b) prevent foothold above the working level.

(4) Suitable fairings on the machine bedplate will be provided if necessary, for the purpose of preventing foothold above the intended standing position of the operator.

(5) The safety limit for both front and back rolls will be indicated clearly by arrows, engraved or permanently secured in position.

(6) The machine will carry a plate with the wording: "This Mill is not safe for operatives who can reach beyond the Safety Limit. The arrow indicates the Safety Limit."

It should be understood that the ultimate responsibility for the safe working of the machine is that of the user, the report states. It was also agreed that after March 31, 1953, all quotations for new mills will include for equipment to the above specification and that all mills supplied after December 31, 1953, will be fitted with this equipment as standard.

The Mill Committee is of the opinion that the majority of existing mills can be modified to come within the recommendations of the NJIC Report, and while there might be a number of firms in the Rubber Industry who will regard the modifications as a matter for their own engineering departments there are many firms without the necessary resources who might well call upon the machinery manufacturers for advice and the fitting of the equipment. In the latter instance machinery manufacturers will apply the same principles as for new mills.

Consideration of the fitting of sensitive safety bars to mills having rolls below 16-inch diameter led to the conclusion that the accommodation of operatives with the bar as a shoulder control is so very limited that some other form of application of the principle must be sought, such as knuckle or fingertip control. Small-scale laboratory mills fall into this category, the report concludes.

Named Brooklyn Polytechnic Dean

The Polytechnic Institute of Brooklyn, Brooklyn, N. Y., has announced the appointment of Dr. Warren L. McCabe as dean of the college of the Institute. The school's ninety-ninth year opened this semester. Dr. McCabe, who is considered one of America's most eminent chemical engineers, has resigned as vice-president and director of research of the Flintkote Co. of Whippany, N. J., to join the Institute's faculty. The new dean has served as president of the American Institute of Chemical Engineers and was head of the Department of Chemical Engineering at the Carnegie Institute of Technology. He succeeds Dr. Erich Hausmann, who retired this year after forty-five years on the Institute's faculty.

Rubber Molding Resin 2088

According to the Thermoid Chemical Co., Trenton, N. J., a hard, non-tacky surface in rubber tile flooring, even at elevated room temperatures, can be obtained with Molding Resin 2088. In processing, MR-2088 incorporates rapidly and aids in the dispersion of dry pigments such as clays. It allows good mold-flow and fill-out without smearing of marbleizing. MR-2088 is nonstaining and highly resistant to discoloration by ultraviolet light. This new, light amber friable resin is odorless and nontoxic with a specific gravity of 1.04. It melts at 176°-185°F. and is soluble in all rubber solvents, the company states.

Nygen Truck Tire Fabric

Another advance in the manufacture of truck tires has been announced by the General Tire & Rubber Co. with the development of a stronger fabric produced from nylon. Made from the synthetic material, the fabric is called "Nygen." It will give truck tires greater strength and tread depth, President William O'Neil said. "As steel is made from iron, Nygen is made from nylon," he explained. "Through this new process of heat-treating and dipping, the fabric is made stronger". He added that one outstanding result is that it eliminates the tendency of nylon to stretch. Mr. O'Neil disclosed that General Tire had invested nearly $1,000,000 in new facilities at the Akron plant to produce the material. Key machines are a new type of drying oven, the first of its kind in the rubber industry, and a new high-speed calender. At full capacity, the drying oven can process 57,000 pounds of Nygen daily. First step in the manufacture of the fabric occurs at General Tire's mills in Aldora, Ga., where nylon yarn is converted to nylon fabric with special twists for added fatigue resistance. In Akron, the cord is dipped in Gentac, a special latex development of the company and then taken to the oven.

Polymer Group Sets Lectures

The Akron Polymer Lecture Group has announced its program for the balance of this year and for the first part of 1954. On November 6, Dr. E. L. Wittbecker (DuPont) will speak on "Condensation Polymers—Structure and Physical Properties", while on December 4, Professor J. D. Ferry (University of Wisconsin) will deliver a paper on "Dynamic Properties of Polymers and Polymer Solutions." On January 8, 1954, Dr. B. C. Barton (U. S. Rubber), will speak on "Mechanism of Sulfur Vulcanization." Dr. W. M. D. Bryant (DuPont) will speak on the "Structure of Polyethylene" on February 5. March 5, Professor R. B. Mesrobian (Polytechnic Institute of Brooklyn) will deliver a paper on "Kinetics of Autoxidation", and on April 2, Professor P. J. Flory (Cornell University) will deliver a paper on "Molecular Configuration in Polyelectrolytes".

Naugatuck Reassigns Bruce

Lawrence H. Bruce, technical representative for the Latex and Aqueous Dispersions Group of the Naugatuck Chemical Division, U. S. Rubber Co., has been assigned to Akron, Ohio, effective immediately. Mr. Bruce, who has been assistant technical sales representative in the New York and New Jersey area, is a graduate of Northeastern University, Boston, Mass. He has been associated with Naugatuck Chemical for approximately 11 years. Previous posts he has held include senior chemical engineer, foreman of Lotol plant, head of process engineering, chemist in latex laboratories, and assistant to the sales manager. In his new post he will make his headquarters at 247 East Exchange Street, Akron. His territory will include Ohio, Western Pennsylvania, part of Indiana, West Virginia and the eastern part of Kentucky.

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PARACRIL BJ—Similar to B, with lower plasticity—easier processing.

PARACRIL BV—Paracril B in crumb form—carries soluble surface coating.

PARACRIL C—Maximum oil resistance —moderate low-temperature flexibility.

PARACRIL CV—Paracril C in crumb form—carries soluble surface coating.

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NAMES IN THE NEWS

R. A. REINKE, formerly superintendent of the Continental Oil Black Co., has been promoted to technical coordinator of the Continental Carbon Co. with headquarters at Amarillo, Texas.

FRED F. VAN ATTA, previously manager of the Building Division, Carolinas Branch, Associated General Contractors, and formerly acting secretary-treasurer of the American Concrete Institute and editor of the *ACI Journal*, has been named special assistant on the headquarters staff of the American Society for Testing Materials.

JOHN J. WALSH has been appointed advertising manager of the Dayton Rubber Co., while ROBERT T. HOLLISTER has been added to the Public Relations Staff as manager.

HARVEY S. FIRESTONE, JR., chairman of the board of the Firestone Tire & Rubber Co., has been reappointed as a member of the International Development Advisory Board by President Eisenhower.

MYRON T. SHAFFER, associated with the B. F. Goorich Co. since 1919, has been named treasurer of the International B. F. Goodrich Co.

JAMES A. GREEN, formerly associated with the Corning Glass Works as traffic manager, has been named director of the U. S. Clay Producers Traffic Association, Inc., with offices in New York City.

E. J. THOMAS, president of the Goodyear Tire & Rubber Co., has been awarded the cross and title of the Grand Officer of the Order of Oak Wreath by Luxembourg for aiding relations between that country and the United States.

WALTER L. RIPPETEAU, associated with the Wyandotte Chemicals Corp. since 1947, has been appointed general product manager of organic chemicals in the Michigan Alkali Division of the company.

ROY J. GAVIN, formerly sales manager of the Sound Recording Tape Division of the Minnesota Mining & Manufacturing Co., has been named as a vice-president of the Irvington Varnish & Insulator Division of the company.

DR. R. RAY ESTES, formerly associated with the University of Kentucky, has joined the research staff of Emery Industries, Inc. At the company, he will be connected with the New Chemical Department.

JOSEPH N. KUZMICK, associated with the Manhattan Rubber Division of Raybestos-Manhattan, Inc., for the past thirty years, has been appointed coordinator of corporation research and development with duties extending to all divisions of the company.

R. O. BAIR has taken a leave of absence from the Goodyear Tire & Rubber Co. to accept appointment as pilot plant superintendent of Rubarite, Inc., Magnet Grove, Ark.

ERNEST NUBER, associated with the Bristol Co., Waterbury, Conn., since 1929, has been appointed sales manager of the Instrument Division with headquarters at Waterbury.

R. E. BLOCH, president of the Mohawk Rubber Co., has been elected a trustee of Mount Union College in Alliance, Ohio.

GERALD ZEIS, associated with the B. F. Goodrich Co. for the past 26 years, has been named assistant factory manager of Rempel Manufacturing, Inc.

CECIL H. CORYAT, vice-president and a director of Stein, Hall & Co., Inc., New York, N. Y., has been awarded the decoration of Officer in the Order of Orange Nassau by Her Majesty, Queen Juliana of The Netherlands, for his outstanding services on behalf of international trade and in promoting better business relations between the U. S. and The Netherlands.

JACK BELL, formerly associated with the research laboratory staff of the Emulsol Corp., has been transferred to the technical sales staff to handle industrial surfactants in the Chicago area, and other company products in Minnesota, Wisconsin and Northern Michigan.

DR. RAYMOND W. MCNAMEE, associated with the Union Carbide and Carbon Corp. since 1933, has been named manager of research administration for the corporation.

RACHEL J. FANNING, formerly associated with the Rubber Section of the National Bureau of Standards, has been named research associate with the American Dental Association Research Fellowship at the Bureau.

Colombo-Peiping Pact Set

Communist China has agreed to supply rice to Ceylon at £49 (about $137) a ton during the next year and buy in return Ceylon sheet rubber at 28d a pound. These figures are a reduction on the contract between Ceylon and Communist China for this year under which Ceylon sells rubber at 32d a pound and buys Chinese rice at £54 a ton. The price Communist China has agreed to pay Ceylon for rubber is about 10d more than average Singapore price a pound. The average world market price also remains more or less at the Singapore price level. Ceylon will sell Red China 50,000 tons of rubber and Red China will sell Ceylon 270,000 tons of rice during the next year.

Elected General Latex President

Gladding B. Coit

Gladding B. Coit, formerly executive vice-president of the General Latex & Chemical Corp., Cambridge, Mass., has been elected president of the company succeeding Kenneth B. Osborn who has been named chairman of the board. Mr. Osborn will also remain active in company affairs in an advisory and consulting capacity. Arthur B. Newhall, formerly chairman of the board, was named honorary chairman. Before joining General Latex in November, 1949, Mr. Coit had long been associated with the financial and banking professions. He has been treasurer of the U. S. Mortgage and Trust Co. of New York, and treasurer of the Curtis Wright Corp. During World War II, Mr. Coit served as an officer in the U. S. Army, and was a member of the War Contracts Price Adjustment Board, and the Price Adjustment Board of the Reconstruction Finance Corp.

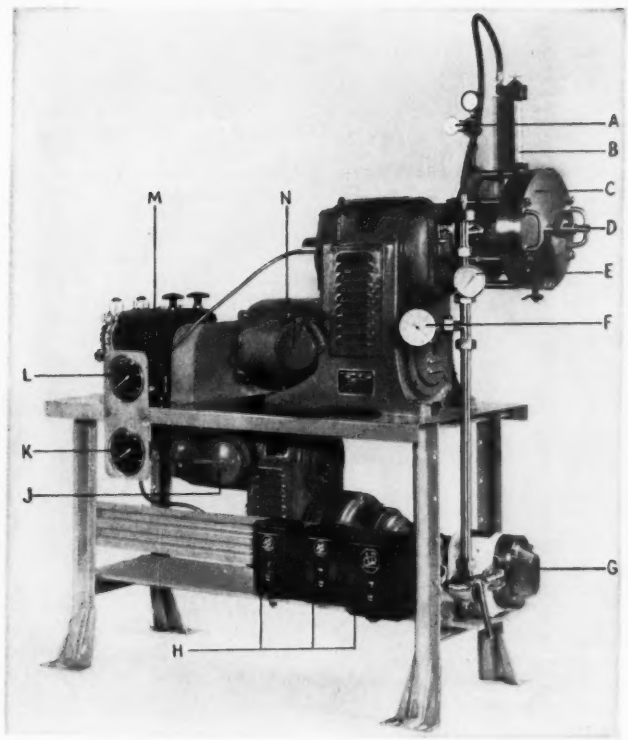
Sets New Safety Record

Seven years without a disabling accident was the record established on September 12 by the 300 men and women of the Scottsville, Va., plant of the U. S. Rubber Co. Since the tire cord plant was built in 1946, its employees have worked a total of more than 4,000,000 man-hours with a perfect safety record. The Scottsville plant is one of eight mills operated by the company's Textile Division. It converts rayon yarn into fabric for the company's tires. During the plant's seven years of operation it has received 18 national, state and company safety awards. An informal celebration was held for the employees on September 14.

Drogin to Discuss Blacks

Dr. Isaac Drogin, director of research of the United Carbon Co., Charleston, West Virginia, will lecture on "Carbon Black—Types and Applications" at the John Marshall Law School in Chicago, Ill., on Tuesday evening, October 27. The lecture is one of several scheduled at the school this semester in connection with the course of rubber chemistry and technology which is given under the auspices of the Chicago Rubber Group.

NEW MIXER FOR FOAM RUBBER NOW IN WORLD-WIDE USE!



A. Air Pressure Regulating Valve
B. Air Flowmeter
C. Mixing Head
D. Discharge Hose Connection
E. Product Thermometer
F. Pressure Gauge
G. Latex Pump
H. Starting Boxes
J. Pump Speed Regulator
K. Pump Tachometer
L. Mixer Speed Tachometer
M. Chemical Proportioning Pumps
N. Mixer Speed Regulator

Only five years ago this new Oakes Continuous Automatic Mixer was unknown. In this short time it has come into use in large plants and small—now more than 300 installations—in the United States, France, England, Canada, Italy, Germany, Holland, Denmark, and other countries. In the United States, for example, it has been adopted by every leading producer of foam rubber without exception. As many as 15 Oakes Continuous Automatic Mixers have been included in single installations. Complete batteries of old machines have been taken out and replaced by Oakes Mixers because of their great advantages.

The Oakes Mixer can be had in two models. It produces foam rubber continuously from make-up tanks to molds, with savings in latex of from 12 percent to 15 percent. Production is from 150 pounds per hour to 900 pounds per hour in the Model 10M3 shown here, up to 1800 pounds per hour from the larger Model 14M5. Quality of foam is superior—more uniform and much finer cell structure, providing greater strength, stability, and smoothness in the finished product. Injection molding is simplified—the closed molds are filled full and rejects are reduced. Human judgment is replaced by mechanical controls that are accurate and immediately responsive. Production is unaffected by weather, climate or air conditions. One Oakes mixer, moreover, will do the work of several batch mixers with large savings in labor and floor space. In fact the advantages of these and other features are so great as to put the user immediately into a much stronger competitive position.

This mixer is patented, exclusive equipment available only through the E. T. Oakes Corporation. We will welcome the opportunity to send you full information.

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Joins American Hard Rubber

James E. Caldwell

James E. Caldwell, assistant comptroller of the Goodyear Tire & Rubber Co. since 1946, has joined the American Hard Rubber Co., New York, N. Y., in the newly-created position of vice-president, finance. His duties will encompass those formerly assigned to Allen H. Ottman, vice-president and controller, who has resigned. Mr. Caldwell was graduated from Northwestern University and is a certified public accountant in Illinois and New York. He is active in the National Association of Cost Accountants and the Controllers' Institute of America, and is also a member of the American Management Association and the American Institute of Accountants. He joined the Goodyear organization in 1941, and was initially assistant comptroller of Goodyear Aircraft. In 1946, he became assistant comptroller of the parent organization from which he resigned to join American Hard Rubber.

Completes Plant Addition

The Hardesty Chemical Division of W. C. Hardesty Co., Inc., recently completed an addition to its plant for the production of its plasticizer "Harflex 500." Besides increasing product capacity, this has led to further improvements in product quality, the company said. Current Harflex 500 is stated to have less odor than most commercial grades of dioctyl phthalate, and the color has been brought to a very pale yellow, making it suitable for practically all applications. Hardesty reports that Harflex 500 is the only low-cost plasticizer to offer a combination of top low-temperature performance, water-resistance, and heat stability.

Wellco Completes New Building

Heinz W. Rollman, president of Wellco Shoe Corp., Waynesville, N. C., has announced that the company has completed its new building for the manufacture of rubber. This new addition, including building and machinery, has cost approximately $100,000 and enables the company, according to Mr. Rollman, to work far more efficiently than was possible in the past. Wellco now manufactures all rubber compounds needed in the manufacture of their "Foamtread" footwear.

LABOR NOTES

The 18th Annual Convention of the United Rubber Workers, C.I.O., held during the week beginning September 14 at Grand Rapids, Mich., approved a merger of the C.I.O. and A.F.L. It was also decided to continue holding annual conventions and delegates, by a voice vote, put through pay raises for top union officials. All officers were re-elected. In other convention action, delegates approved an amendment calling for appointment by the local president, with approval of the Executive Board, of guides and sentinels.

Delegates also killed proposals that would have jumped first month's union dues from the present $4 to $10, and raised by 50c the present $2 to $3.50 dues scale. Delegates defeated a move to make mandatory appointment as district directors someone already a resident of the district.

Voted down was an amendment designed to give district directors two-year appointments. They are now appointed annually by the president. The delegates also approved a change that allows the international president to call and preside at meetings of locals. Convention delegates also promised to expand their political action activity in preparation for the 1954 Congressional elections.

Goodyear, General Tire and the Seiberling Rubber Co. recently signed new "package" agreements with the U.R.W., following the general lines of agreements signed earlier by Goodrich and Firestone. General pay raises ran from 2½ to 5½c an hour, sick, accident and pension benefits.

Settlement of a labor dispute at the Berea Rubber Co., Berea, Ky., was recently announced by the National Labor Relations Board. The firm agreed to stop interfering with union activities of employees; quit contributing money or other support to the Welfare and Safety Committee or any other labor organizations of employees; withdraw recognition of the Welfare and Safety Committee as bargaining agent for employees; and reinstate 10 employees without prejudice.

In a recent NLRB poll of employees at the Robbins Tire & Rubber Co. and the Robbins Floor Products Co., both of Tuscumbia, Ala., 470 voted against unionization, 71 for the CIO, and 6 for the AFL. The State of Alabama recently placed into effect a new "right to work" law. A union spokesman said the "disappointing" results reflected the impact of this new tightened labor law.

RMA Amends Type Descriptions

On September 1, the Rubber Manufacturers Association issued Amendment I to "Type Descriptions and Packing Specifications for Natural Rubber," orginally issued on July 1, 1952. Amendment I contains certain clarifying changes in the packing specifications for thick pale crepes, thin pale crepes and estate brown thin crepes. Substantial amendment has also been made to Sections 6 and 7 of the packing specifications pertaining to "Talc Specifications" and "Bale Coating Solution".

Baughman Joins Automotive Rubber

Robert O. Baughman

Robert O. Baughman, formerly associated with the Heveatex Corp., has joined the Automotive Rubber Co. of Detroit, Mich. Mr. Baughman will be in charge of the company's recently enlarged Rubber Product Development Department. In addition to his functions as chemical laboratory head, Mr. Baughman will assume top responsibilities for latex product development and sales. He began his chemical product development career with the Goodyear Tire & Rubber Co. He is credited with the development of many compounds and procedures in the uses and handling of natural and synthetic latices.

NBS High Polymer Lectures

The Division of Organic and Fibrous Materials of the National Bureau of Standards, Washington 25, D. C., is sponsoring a series of six lectures on the chemistry and physics of high polymers. The lectures will be held on the Bureau grounds and are open to the general public. The first of the lectures was to have been held on October 6 and was to have featured an address by T. G. Fox (Rohm & Haas) on "The Glassy State in Polymers." On November 6, F. R. Mayo (G-E) will deliver a paper on "Some Recent Developments in Chain Transfer." J. D. Ferry (University of Wisconsin) will deliver a paper on "Mechanism of Fibrin Formation" on November 30. On March 9, 1954, W. H. Stockmayer (M.I.T.) will speak on "Copolymers in Dilute Solution." Other lectures have been scheduled by P. J. Flory (Cornell University) and P. D. Bartlett (Harvard University), who will speak on "Inhibition and Isotope Effects in Polymerization Kinetics." Further information regarding the lectures may be obtained from Dr. Leo Mandelkern, Rubber Section, National Bureau of Standards.

Arkansas Possible Plant Site

According to recent reports, U. S. Rubber Co. is considering the State of Arkansas as the possible site for a large new plant. It was said that Governor Cherry was handling the contact work himself in an effort to get the plant for his state. The company was expected to make its decision by November 1.

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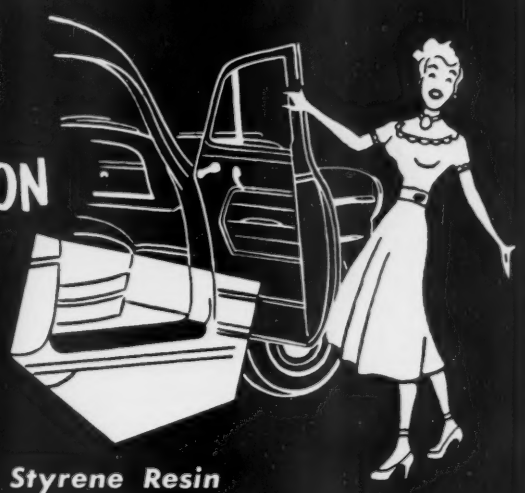

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U. S. Rubber Names John Coe

John P. Coe

John P. Coe, vice-president of the U. S. Rubber Co., has been named to handle the company's interests in the transfer of synthetic rubber plants from the government. His appointment is effective immediately. Mr. Coe has been detached from his duties as general manager of the Naugatuck Chemical Division to devote full time to his new assignment. His major duty will be to work with the synthetic rubber plant disposal commission to be appointed by President Eisenhower. As head of the company's chemical division, Mr. Coe supervised the design and construction of 2 of the government's 15 synthetic rubber plants and managed the operation of 5 of them.

Rayon Replacing Cotton in Belts

The Industrial Products Division of the Goodyear Tire & Rubber Co. has announced that transmission belting constructed with rayon plies is rapidly replacing similar belting manufactured in top quality with cotton plies. Starting with an extensive testing program of field installations on tough-drive jobs more than four years ago, the rayon-ply belt proved superior to cotton as it had in previous laboratory tests. Goodyear began full-scale production of the new belt a year ago. It is constructed with rayon duck plies in the center with a ply of heavy cotton duck on top and bottom, except for belts using less than five plies which are all rayon. This construction gives a thinner, more flexible belt than those made with conventional cotton plies. Tension is carried in a central core of low-stretch rayon plies, thus reducing bending stress and belt elongation. The new belting is designed to be installed endless or with fasteners.

U.B.S. Appoints Alfa Rubber

The appointment of the Alfa Rubber Corp., Exporters, of 30 Broad St., New York 4, N. Y., to the Foreign Trade Division of Union Bay State Chemical Co., Inc., Cambridge, Mass., was recently announced. The Alfa Rubber Corp. staff will provide world wide technical sales service to customers for the U.B.S. line of latex adhesives, solvent cements, coatings, emulsions, polymers, and other chemicals.

FINANCIAL NEWS

Firestone Tire & Rubber Co.

Nine Months to July 31: Net income of $32,626,278, which is equal to $8.21 a share, compared with $29,099,954, or $7.35 a share, in the comparable period of the preceding year. Net income for the nine months ended July 31, 1953, was after providing a reserve of $974,000 for earnings of certain foreign subsidiaries which cannot be remitted. In the nine months ended July 31, 1952, a similar reserve against unremitted earnings of foreign subsidiaries amounted to $9,543,000. Provision for federal and foreign income taxes during the 1953 period increased to $41,900,000 from the $38,853,000 in the 1952 period.

Mansfield Tire & Rubber Co.

Six months to June 30: Net profit of $831,332, which is equal to $1.50 a common share, compared with $591,321, or $1.07 a share, in the first half of the previous year. Sales in the first half of 1953 rose to $33,192,858 from the $25,737,237 recorded in the first half of 1952.

Dayton Rubber Co.

Nine Months to July 31: Net profit of $1,305,781, which is equal to $2.10 a common share on net sales of $43,981,346, compared with $1,134,356, or $1.81 a share on sales of $38,354,363 in the comparable period of the preceding year.

Faultless Rubber Co.

Year Ended June 30: Net profit of $400,694, which is equal to $3.00 a common share, compared with $313,436, or $2.34 a share, in the preceding year.

U. S. Rubber Reclaiming Co.

Thirty-Six Weeks to September 13: Net income of $135,550, compared with $144,080 in the same period of 1952.

Establishes Marketing Division

Sinclair Refining Co., New York, N. Y., has announced the establishment of a new marketing division to be responsible for the sale of petroleum products that are used as materials in the manufacture of other products. Designated the Process Material Division, the new organization will handle waxes, petrolatums, resins, industrial asphalts, and other products sold as materials for processing or further manufacture. It will be responsible also for the development of new petroleum products to serve the requirements of the process industries. Harold E. Bryson, formerly manager of the company's Wax and Petrolatum Division, has been named manager of the new division and will continue to make his headquarters in New York.

An index to Volume 73 of RUBBER AGE will be found on Pages 159 to 162 of this issue.

Nelson Receives Degree

Oscar Nelson

Oscar Nelson, president and general manager of the United Carbon Co., received an honorary doctor of laws degree on October 1 from Upsala College in East Orange, N. J. Mr. Nelson was cited for his achievements as an industrial leader of Swedish birth. The special convocation was held during Upsala's 60th anniversary celebration. The following day, Mr. Nelson and his wife left for Europe and a tour of England, France and Sweden.

Tire Prices Increased

On October 1, U. S. Rubber Co. announced a general price increase for passenger car and truck tires and tubes ranging from 2.5 to 5%. As of that date, all passenger car casings were increased 2.5% and passenger car tubes, 3.5%. All types of truck tires and tubes were increased 5%. In addition, industrial pneumatic tires and tubes and farm tires and tubes were raised 2.5%. The U. S. Rubber move was followed by similar announcements from the General Tire & Rubber Co. and the Seiberling Rubber Co. On October 3, Goodrich, Goodyear and Mohawk Rubber announced raises similar to those announced by U. S. Rubber. At this writing, only Firestone had not yet announced an increase. It is estimated that the new list price for the popular-sized passenger car tire will be $22.60 under the new price schedules.

RFC Liquidates Test Facilities

Sales of $96,800 worth of automotive equipment resulting from liquidation of tire testing facilities near San Antonio, Texas, were recently announced by the Reconstruction Finance Corporation. It was also announced that in the future, tire testing required by RFC in its synthetic rubber research program will be provided by privately-owned facilities under contract. Among the items disposed of were passenger cars and trucks, automobile parts, tires, etc. The Armstrong Tire & Rubber Co. of Natchez, Miss., purchased tachographs, cast iron test weights and a wood test body in the sale.

Comparison of Hi-Sil "C" and MPC Black in a Medium High Acrylonitrile Content Copolymer

FORMULAE	A	B
Nitrile Rubber (32% acrylonitrile content)	100	100
Hi-Sil "C"	65	.....
MPC Black	.....	60
Zinc Oxide	5	5
Sulfur	2.0	1.5
MBTS	1.5	1.5
TMTDS	0.5	.....
DPG	.....	0.2
25°C. m.p. Coumarone resin	8	8
Aromatic softener	7	
Stearic Acid	1	

Mins. Cure at 310°F.	Modulus 300%	Tensile	Elong.	Duro. Hard. 0"	Duro. Hard. 30"	Tear lbs./inch
COMPOUND A—Hi-Sil "C"						
30	1890	3990	510	78	66	370
45	1740	3830	500	78	67	350
90	2030	4200	490	78	70	430
COMPOUND B—MPC Black						
30	1840	3470	490	72	59	330
45	2100	3720	470	73	60	320
90	2500	3990	430	73	62	310

HI-SIL "C"

sets a new high standard of dependable quality

Regular Hi-Sil is recognized by most compounders as the *best* silica for high quality in non-black rubber goods.

But Columbia-Southern's research staff, not content with the best, has come up with a new silica called Hi-Sil "C."

Hi-Sil "C" outperforms regular Hi-Sil in all elastomers, both natural and synthetic. Hi-Sil "C" sets a new high standard of dependable quality. And Hi-Sil "C" enables you, in non-black nitrile rubber compounds, to obtain a tensile strength in excess of 4000 p.s.i. and tear resistance of over 400 pounds per inch.

Sample quantities of Hi-Sil "C" are available for your evaluation. Limited commercial shipments are ready from our interim plant production. Write our Pittsburgh office now!

District Offices: Cincinnati • Charlotte • Chicago • Cleveland • Boston • New York St. Louis • Minneapolis • New Orleans • Dallas • Houston • Pittsburgh • Philadelphia San Francisco

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

ONE GATEWAY CENTER, PITTSBURGH 22, PENNSYLVANIA

LOS ANGELES NEWS

The technical session at the October 6th meeting of the Los Angeles Rubber Group, scheduled to be held at the Hotel Statler in Los Angeles, Calif., was to have been addressed by R. M. Thomas of the Standard Oil Development Co., and W. H. Peterson of the Enjay Co. Mr. Thomas was to have spoken on "Butyl—Manufacture and Research", while Mr. Peterson was to have addressed the meeting on "Butyl—Present and Future". A full report on the meeting will appear in a future issue of RUBBER AGE.

Gross Manufacturing Co. recently completed an 8,000 square foot addition to its plant at Monrovia, Calif.

Sam Ramelson, formerly associated with the Technical Tape Corp. at Burbank, Calif., has been transferred to the Montreal, Canada, plant of the company.

Bud Field has joined the Product Research Co. at Glendale, Calif.

In order to provide for an extensive program of tooling and new machinery for modernization of manufacturing processes which will provide more efficient and more economical operation, the board of directors of the National Motor Bearing Co. recently voted to reduce the third quarter dividend to 25c from the 40c which had been paid quarterly during the past three years. The dividend was paid on October 1 to stockholders on record as of September 18.

A fire and blast of undetermined origin hit the plant of the American Cyanamid Co. at Azusa, Calif., on September 15. Damages were estimate at $25,000. One man was critically burned and several others injured.

William C. Imholz has been named to head the West Coast plastics technical service group of the Naugatuck Chemical Division, U. S. Rubber Co. A graduate of the University of Illinois, Mr. Imholz has been with Naugatuck since he joined its Production Department in 1944. The following year he was assigned to plastics research. Prior to his new assignment, he was senior group leader in plastics evaluation and development. Mr. Imholz will make his headquarters at Naugatuck Chemical's Los Angeles, Calif., office, 5901 Anaheim-Telegraph Road.

Hugh N. McClanahan and Harold C. Colgrove, both formerly associated with the Griffin Chemical Co. of San Francisco, Calif., are now conducting a chemical and chemical additive business as co-partners at 3155 Leonis Blvd., Vernon, Calif., under the firm name of the Chemical-Additives Co. The company, established May 1, 1953, has been appointed Southern California representatives for Griffin Chemical, Edgar Brothers Co., Enjay Co., Foote Mineral Co. and Vegetable Oil Products Co., Vopcolene Division. The latter three firms are represented jointly with the Evanstrom Co. of San Francisco.

Dr. John D. Roberts, professor of organic chemistry at the California Institute of Technology, has been named recipient of the 1954 American Chemical Society award in pure chemistry. The $1,000 award, given annually to an outstanding chemist in recognition of his contributions in fundamental research, will be presented at the Spring Meeting of the society in Kansas City. Professor Roberts has conducted research in the field of physical organic chemistry since 1940. His chief investigations have dealt with theoretical organic chemistry and he has conducted radioactive tracer research and studies on small-ring organic compounds and rearrangement reactions of organic compounds. Professor Roberts is a 1941 graduate of the University of California at Los Angeles.

B. F. Goodrich Co. has completed the installation of a battery of twenty-four dual-cavity Bag-O-Matic tire curing presses at its East Los Angeles plant. The new type presses, installed at a cost of more than $19,000 each, will reduce tire curing time and allow safer, faster and more economical production, according to the company.

Flek Corp. has announced the appointment of Clint Booth, as general sales manager, to handle the firm's expanded lines of industrial plastics.

G-E Sets New Sales Districts

New sales districts have been established by the Silicone Products Department of the General Electric Co. in the East and Mid-west, to meet increased industrial and consumer demand for silicone products. The districts will be headquartered in New York and Cleveland, respectively. Albert L. Baldock has been appointed manager of the eastern sales district, with offices at 570 Lexington Ave., in New York City. The mid-western sales district will be managed by Constantine L. Chase, whose headquarters will be at 1105 Chester Avenue, Cleveland, Ohio. Mr. Baldock is a native of Lynchburg, Virginia, and is a graduate of Virginia Polytechnic Institute with a B.S. degree in chemical engineering. He came to General Electric in 1947 as a member of the advanced scientific training program and joined silicone sales headquarters in Waterford, N. Y., in 1948. Silicone sales representatives with offices in Boston, New York City and Philadelphia will report to Mr. Baldock. A native of Springfield, Ohio, Mr. Chase is a graduate of Ohio State University with a B. S. degree in chemical engineering. He joined General Electric in 1947 as a member of the Scientific Training Program and was transferred to Pittsfield in 1948, where he has held various posts preceding his present appointment. Mr. Chase is a member of the American Chemical Society and served in the U. S. Army during World War II. Silicone sales representatives, with offices in Cleveland, Detroit, Chicago, and Cincinnati, will report to Mr. Chase.

Neville Announces Name Change

To more aptly relate its corporate name to the field which it has served through the years, the Neville Co. of Pittsburgh, Penna., has changed its name to the Neville Chemical Co. Only the name has been changed, products and personnel remain as heretofore.

WESTERN INSULATED WIRE ADDS MANUFACTURING AND WAREHOUSE SPACE

Western Insulated Wire Co. of Los Angeles, Calif., has added 15,000 square feet of floor space to its existing 40,000 square foot plant. The additional space was added to enlarge rubber mixing operations and to provide additional finished goods warehouse space. The company was established in Los Angeles in 1937 by Edward H. Lewis, president. The company states that its principal products are neoprene jacketed portable electric cords and cables.

announcing
a change in name
FROM
THE NEVILLE COMPANY
TO
NEVILLE CHEMICAL COMPANY
To more aptly relate our corporate name to the ever-growing field which we have served through the years, and to more readily identify the scope of our products and service, we have changed our name.
Needless to say, only the name has been changed, and we hope the new name will come to symbolize the same high standard of quality that has characterized the old throughout the industry.
NEVILLE
PRODUCTS OF TOMORROW
FROM THE CHEMICALS OF TODAY
C6
NEVILLE CHEMICAL CO.
PITTSBURGH 25, PA.
Plants at Neville Island, Pa., and Anaheim, Cal.

CANADIAN NEWS

Another trial of seven rubber companies and the Rubber Association of Canada on charges of operating a combine to fix prices of rubber tires and tubes has been scheduled to start on November 16 in Toronto. Facing trial are the Firestone Tire & Rubber Co. of Canada, Ltd., Dominion Rubber Co., Ltd., B. F. Goodrich Rubber Co. of Canada, Ltd., Dunlop Tire & Rubber Goods Co., Ltd., General Tire & Rubber Co. of Canada, Ltd., Gutta Percha & Rubber, Ltd., and the Rubber Association of Canada.

It is charged that between January 1, 1937 and October 31, 1952, these companies and the Association unlawfully conspired unduly to prevent and lessen competition in the production, sale and supply of tires and tubes. When none of the companies would enter a plea, the chief justice of the court directed that a "not guilty" plea be recorded.

No date has been set for the trial of the Dominion Rubber Co., Goodrich, Gutta Percha, Alfred Lambert, Inc., Kaufman Rubber Co., Miner Rubber Co., Northern-Woodstock Rubber, Ltd., and the Rubber Association of Canada on another and separate indictment which charged that these companies, between July 12, 1944 and October 31, 1952, unlawfully conspired with Concord Rubber, Ltd., and Acton Rubber, Ltd., to fix prices on rubber footwear.

T. N. Phelan, special Crown prosecutor, suggested the November 16th date for the trial of companies charged with operating a combine in tires. He estimated the trial would last about three or four weeks. Counsel for the Rubber Association and the counsel for General Tire objected to the November date, stating a January trial would be more suitable. The court and the prosecutor, however, objected.

On September 27, Goodyear Tire & Rubber Co. of Canada, Ltd., Dominion Rubber, Dunlop Tire, Gutta Percha and Goodrich were fined a total of $50,000 for operating a combine in mechanical goods, such as fire hose, mats and floor coverings.

Vincent Patrick Reid, executive vice-president of the General Tire & Rubber Co. of Canada, Ltd., was recently honored by more than 250 civic, professional and business leaders and officials of his firm on his completion of 25 years' service with General Tire.

Dow Corning Silicones, Ltd., has been formed as a Canadian subsidiary with an authorized capitalization of $450,000. The new subsidiary plans to start construction of a warehouse and office building in the near future on a 4½ acre plot in North York Township, 6½ miles from the center of Toronto. Dow Corning said its Canadian patents on the uses and compositions of organic-silicon compounds are being assigned to the new subsidiary, which will take over Canadian sales of silicone products next January. The sales personnel of the Dow Corning Products Division of Fiberglas Canada, Ltd., who have been developing the Canadian market for silicone products, will be transferred to the newly-formed subsidiary.

Shawinigan Chemicals, Ltd., has separated its research and development departments and has named P. W. Blaylock vice-president of the latter unit. Mr. Blaylock, who previously was assistant to Dr. R. S. Jane, vice-president in charge of both of those departments, in his new post will direct studies of new products and processes for Shawinigan and its subsidiary and associated companies. Dr. Jane, who will continue as vice-president in charge of research, will assume added executive duties as well. Mr. Blaylock, a member of Shawinigan's executive committee, is a director of St. Maurice Chemicals, Ltd., McArthur Chemical Company, Ltd., and Chemicals, Ltd. He has been with Shawinigan since 1934.

Unionized workers in most of Ontario's large rubber plants will seek a general wage increase of 20 cents an hour and an extensive welfare program fully paid for by the companies. Announcement of the 1953 demands was made following a recent meeting of local union presidents of the CIO United Rubber Workers' District 6. Welfare demands include life insurance of $4,000, accidental death and dismemberment insurance of $4,000—of which 2,000 would be continued for retired employees or those who left with severence pay. The union is also seeking sickness and accident benefits of $40 a week, semi-private hospital care, surgical payments up to $250, doctor's calls, and X-ray and laboratory expenses.

More "made in Canada" chemicals—formaldehyde for use in plastics, and pentaerythritol which is used in making paints, varnishes and lacquers—received official recognition recently with the opening of the $3,000,000 plant of St. Maurice Chemicals Ltd., at Varennes, a small village near Montreal. The new plant is capable of producing annually 30,000,000 pounds of formaldehyde and 3,000,000 pounds of pentaerythritol, the latter never before produced in Canada.

Francis Shaw & Co., Ltd., Manchester, England, has announced the formation of a Canadian company registered as Francis Shaw (Canada) Ltd., at Graham's Lane, Burlington, Ont. The new company is erecting an engineering plant in Burlington, which will initially operate as a service depot for Shaw equipment in Canada and the U. S. and will eventually manufacture rubber and plastics machinery for direct supply in those countries. R. D. Gerrie has been appointed general manager of the new company.

Canadian production of polyethylene will soon begin at the new $3,000,000 Canadian Industries, Ltd., plant in east Edmonton, according to a recent announcement. Natural gas for production will be piped from the Imperial Oil extraction plant at Devon, about 15 miles southwest of that city.

Polymer Corp., Ltd., has opened its new research laboratory building at Sarnia, Ont., a $250,000 structure with 20 laboratory areas and a research library. J. D. Barrington, Polymer's president, noted that the opening coincided with the 10th anniversary of Polymer's first production of synthetic rubber. Polymer, said Mr. Barrington, is spending almost $1,000,000 a year on research projects. The new laboratories have Sarnia's first electron microscope, the third in Canadian industry. The $25,000 machine can magnify up to 120,000 times, enough to see the structure of molecules.

Seiberling Rubber Co. of Canada, Ltd., has announced the election of M. C. Deans to the board of directors, replacing L. T. Rosser, who has recently resigned to engage in other activities. Mr. Deans is president of the Bankers Bond Corporation Ltd.; vice-president of Hahn Brass, Ltd.; a director of Fittings, Ltd., and of the Union Acceptance Corp., Ltd.

B. F. Goodrich Rubber Co. of Canada, Ltd., has announced the appointment of Trevor L. Jones as press-radio relations representative, effective immediately. For the past year, he has edited the Goodrich dealer and employee magazines. In addition to his new assignment, he will continue in this capacity.

St. Clair Promotes Three

Promotion of three officers of the St. Clair Rubber Co., Detroit, Mich., was recently announced. Lee R. Turner, formerly vice-president, has been promoted to executive vice-president; Louis J. Stverak, previously plant manager, has been named a vice-president, and Frank E. Lester, formerly controller, has also been named a vice-president of the firm. Mr. Turner joined the company in 1944 as assistant general manager. Previously, he had been associated with the Goodyear Tire & Rubber Co. Mr. Stverak joined St. Clair Rubber in 1942 as plant superintendent, while Mr. Lester has been associated with the company since 1926.

Texas-Intercontinental Merge

The merger of Texas Instruments, Inc. and the Intercontinental Rubber Co. became effective at the close of business on September 30, following approval of the merger plan by stockholders or both companies. Texas Instruments, Inc. of Dallas, Texas, is the surviving company. Eugene McDermott remains as chairman of the board and J. E. Jonsson remains president. Under terms of the merger agreement, Intercontinental Rubber stockholders received one share of Texas Instruments stock for each share of Intercontinental Rubber held.

Useful for: Paints – Adhesives – Cements – Anti-Rust Compounds – Floor Tile – Textiles Waterproofings – and many other products

PICCOUMARON

Para-Coumarone-Indene Resins

Available in ten melting points from a liquid to tough, brittle solids. Brief descriptions of principal properties are given below. Complete data and samples will be gladly sent upon request.

SOLUBILITY

All grades are soluble in coal tar solvents, turpentine, terpene solvents, most ketones, most chlorinated solvents and derivatives, and esters. Most grades are soluble in drying and semi-drying oils.

COLORS

Colors vary from light (Coal Tar Resin Color Scale numbers 1½ to 3½) through medium, reddish, dark to extra dark (numbers 12-16).

GRADES

Standard grades include ten melting points and six colors. Special grades are made for users where requirements are large enough to make special runs economical.

WEIGHTS

PICCOUMARON Resins vary in weight according to the melting point, averaging 8.5 to 9.2 pounds per gallon.

CHEMICAL PROPERTIES

Have good acid resistance, being inert to all except concentrated oxidizing acids; good alkali resistance; do not react with most pigments. Composition is essentially para-coumarone-indene polymer.

PLASTICIZERS

Suitable plasticizers include: most of the chemical or ester types; most of the aromatic hydrocarbon types; most heat-bodied oils; cottonseed pitches; soft petroleum residues.

COMPATIBILITIES

The compatibility of various grades of PICCOUMARON RESINS has been determined for waxes, resins, petroleum and coal tar residues, pitches, pine tar, paint and varnish oils, rubber and rubber-like materials, chlorinated and other materials.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.

CLAIRTON, PENNSYLVANIA

Plants at Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

Distributed by

OBITUARIES

Benjamin W. Collins

Benjamin W. Collins, chief corporation chemist of the American Viscose Corp., died suddenly on September 15 while on vacation at Blue Mountain Lake, N. Y. He was 64 years old and scheduled for retirement early next year, after more than 30 years with the corporation. Born in Swarthmore, Penna., he was graduated from Swarthmore College. For a short time he was employed by E. I. du Pont de Nemours & Co. and the Amalgamated Leather Co., before joining American Viscose in 1921 as a chemist. In 1936, he was named chief chemist for the company's rayon plant, and in 1946 was made chief corporation chemist with supervisory charge of the technical departments of all plants of the corporation. His contributions to the chemistry of synthetic fiber production were many, especially in the field of quality control techniques. He is survived by his wife.

Walter J. Cope

Walter J. Cope, widely-known in Akron banking and industrial circles for more than 50 years and former treasurer of the Mohawk Rubber Co., died on September 16 at his home in Akron, Ohio. Mr. Cope had been in failing health for a number of years and until his retirement two years ago was secretary of the Akron Retail Grocers and Meat Dealers Association. Born in Marion County, Ohio, Mr. Cope was graduated from the Eastman Business School at Poughkeepsie, N. Y. He joined the old Diamond Rubber Co. as a bookkeeper and in 1913 joined the newly-organized Mohawk Rubber Co., where he was eventually promoted to treasurer. In 1925, he resigned from the rubber company to join the old Commercial Savings & Trust Co. of Akron. From 1935 to 1951 he was secretary to the then Mayor of Akron. He is survived by his wife and daughter.

George W. Miller

George W. Miller, chief chemist of the W. J. Voit Rubber Corp. of Los Angeles, Calif., died on September 29 in Huntington Memorial Hospital, Pasadena, Calif. He was 53 years old. Born in Irwin, Penna., Mr. Miller was graduated from the University of Pittsburgh in 1925. Upon graduation, he joined the Firestone Tire & Rubber Co., where he stayed until 1933 when he was transferred to the Xylos Division as chief chemist. In 1942, Mr. Miller was named chief rubber development engineer for the Guayule Research and Experimental Station in Salinas, Calif. Four years later, he joined Voit Rubber as chief chemist. Mr. Miller was very active in activities of the American Chemical Society and had been an officer of the Los Angeles Rubber Group in 1952. He is survived by his wife and son.

Albert B. Cunnington

Albert B. Cunnington, oldest employee with the Goodyear Tire & Rubber Co., and a veteran of more than 55 years with the firm, died on October 1 at City Hospital in Akron, Ohio. He was 89 years old. He joined Goodyear on September 23, 1898, when the company was just getting started. His initial job was that of the company's first receiving clerk. As the company grew, he later had charge of compounds, crude rubber, fabric and coal supplies. He also was the first full-time secretary of the Goodyear Relief Association, holding that position for five years. In 1938, he was assigned the job he held until the time of his death, that of the company's official greeter and receptionist in the main office lobby. Born in England, Mr. Cunnington came to Akron with his parents when he was 5 years old. Funeral services were held in Akron on October 5. He is survived by two sons and two daughters.

George H. Noble

George Hubert Noble, former secretary-treasurer of the Dominion Rubber Co., died recently at his home in Toronto, Ont., Canada. He was 72 years old. At the time of his death he was secretary-treasurer and a director of Sidney Caplan Co. of Toronto. Mr. Noble had been associated with Dominion Rubber for thirty years. He leaves his wife and two sons.

CD Mold Release B-2

A new mold release for polyester, epoxy, and other plastics and materials has been developed by the Chemical Development Corp. of Danvers, Mass. This new product is intended for use primarily on porous or semiporous molds, including wood, polyester, plaster of Paris, aluminum, and similar materials. Called "CD Mold Release B-2" it is supplied as a paste. It can be easily applied to the mold surface with a cloth or brush and can be rubbed down if desired to a thin coating which is practically invisible. It is insoluble in the resin and will not interfere with the proper cure of the plastic itself. Because it is quick drying, a fast molding cycle is therefore possible. It has a high flash point and does not require a red label for shipment and storage. It has very high heat resistance and will not run or sag under very high temperature conditions, the company states.

Binney & Smith Announces Move

Binney & Smith Co., formerly located at 41 East 42nd St. in New York City, has announced a move to 380 Madison Avenue, New York 17, N. Y. The new offices are said to include every modern facility for efficient operation. The telephone number will remain the same.

CORRECTION

True Loges

In the September, 1953, issue of RUBBER AGE, there appeared a news item concerning the appointment of Richard L. Loges and Thomas P. True to the sales staff of the Binney & Smith Co. The photographs which accompanied the item were incorrectly captioned in that Mr. Loges' name appeared under Mr. True's photograph, and vice versa. The correctly captioned photographs appear above. We sincerely regret the error.

General Tire Sales Appointments

Three key changes in the sales organization of the Industrial Products Division of the General Tire & Rubber Co. have been announced by Charles P. Bender, general sales manager of the division. William A. Wright has been named sales manager of automotive products; Jack L. Shafer is the new sales manager of mechanical products; and Clarence W. Tyte has been appointed manager of sales operation for the division. They will all headquarter at the Wabash plant, reporting to Mr. Bender. Mr. Wright, a native of Akron, has 30 years' experience in the rubber industry. Since 1937, he has been engaged in sales work at Wabash. Mr. Shafer, former assistant works manager of Jack & Heintz in Cleveland, joined General Tire at Akron last year. He is a native of Davenport, Iowa, and a graduate of Case Institute of Technology with a bachelor of science degree in chemical engineering. Mr. Tyte, new sales operations manager, has been associated with the rubber industry for more than 30 years. He joined General Tire in 1937 at Wabash, and recently served as factory manager of the division's Logansport operation.

Moves Chemical Products Sales

The Chemical Products Sales Department of the Chemical Division, General Mills, Inc., has been moved from Minneapolis, Minn., to Kankakee, Ill. Sewall D. Andrews, Jr., is general manager of the division. Manager of Kankakee operations is W. B. Brown, and Abner C. Hopkins, Jr., is director of chemical sales. Mr. Hopkins will be assisted by M. S. Herban, S. J. Murphy and W. S. Mitchell, who have been appointed managers of technical sales and service for eastern, central and western districts, respectively. Purchase of all raw materials will be handled at the new office under the direction of L. C. Young. The Kankakee plant produces a complete line of fractionally distilled fatty acids, modified fatty acids and oils, and a series of polyamide resin materials.

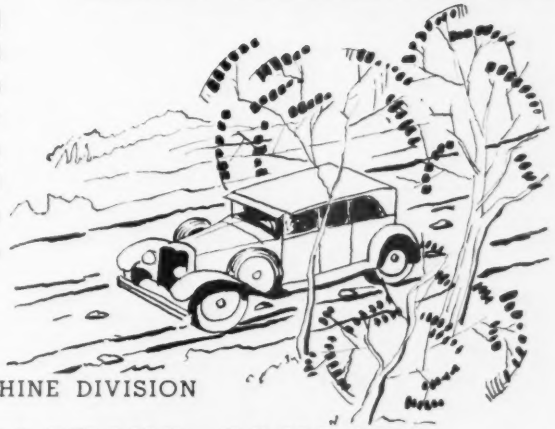
REMEMBER THIS TREAD?

IT IS THE TREAD OF THE *ARMSTRONG "SENIOR" . . . FIRST TIRE GUARANTEED UNCONDITIONALLY AGAINST ROAD HAZARDS

IN 1912, while world news blazed with such memorable headlines as "Titanic sinks", and "Wilson is elected President", the Armstrong Rubber Company was founded without fanfare . . . not even an announcement to the trade. Yet a few years later this company was commanding the attention of the entire rubber industry and the motoring world alike, with its Armstrong "Senior" Tire. It was the *first* tire to offer an unconditional "road hazard" guarantee, and its introduction in 1923 made an impact on the trade - - and the public - - which most of us still remember.

At Bridgwater, we safely leave it to the Armstrong "Senior", its modern counterpart, the "Rhino-Flex", and many *other* top flight tires, to attest the quality of the tire molds we build . . . Tire mold making has been our business for nearly half a hundred years, and most of the famous tires of both today and yesterday have come from molds produced in our shops.

The Bridgwater Athens Machine Division, in Athens, Ohio, is, we believe, the only plant in the world *exclusively* devoted to tire mold making. Here, skilled metalworking craftsmen and specialized machine tools - - many of our own design - - meet today's tire industry requirements with molds of every size and type, in engraved steel, cast iron and aluminum. Unhampered by any other manufacturing obligation, our Athens Division is able to meet these needs quickly, precisely, and at costs favorable to the tire manufacturers.



ATHENS MACHINE DIVISION

THE BRIDGWATER MACHINE COMPANY

Akron, Ohio

1838

BAIRD

RUBBER

AND TRADING COMPANY, INC.

Plantations
Wild Rubber
Sole Crepe
Latex

For Dependable Service on ALL your Rubber Requirements

BAIRD **Since 1903**

233 BROADWAY

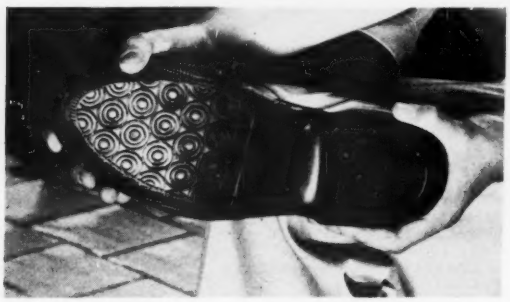
NEW YORK 7, N. Y.

WOrth 4-1460

NEW GOODS

Tri-Vac Safety Rubber

A new safety rubber, approved for U. S. Navy use, is now available for industrial and civilian use according to the Tingley Rubber Corp. of Rahway, N. J. Made of neoprene, the new rubber, called the "Tri-Vac Safety Rubber", features a unique sole. The squeegee action of the concentric suction cups on the sole prevent slipping, making the rubber particularly useful in the presence of oils, greases, acids, chemicals, solvents, etc. The rubber is molded in one piece with no fabric lining,



and is extremely light in weight (9 ounces). Three sizes will fit virtually all shoes, the manufacturer states. The smooth interior slips on and off the shoe easily, and the rubber can be turned inside out for washing. The elasticity of the neoprene prevents the rubber from pulling off the heel accidentally. The rubber is also made in natural rubber for use in ordinary street wear where it will protect against the hazards of slipping on wet or icy pavements.

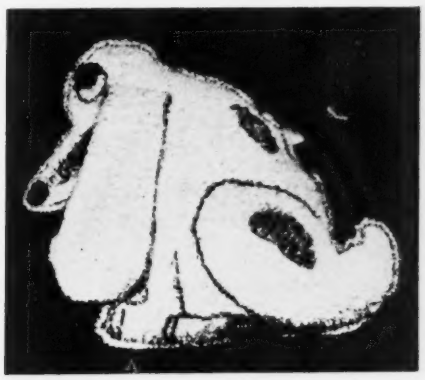
Rocket Swim Accessories

Martin Rubber Co., Long Branch, N. J., has introduced a line of "Rocket" swim accessories, including goggles, masks and swimming fins. Colored a cheerful ocean green, the line is made of good quality rubber. The swim accessories have nickel-plated fittings and fasteners.

The goggles, as shown above, are available in junior and senior sizes, and, like the masks, have shatterproof lenses for clear, safe, underwater vision. Rocket masks are made in oval, triangular and round types. Fins have snap-on straps which are adjustable.

Foam-Filled Tub Toy

Ace Exhibits Co., Brooklyn, N. Y., has introduced "Farfel", a foam rubber filled terry cloth dog patterned after ventriloquist Jimmy Nelson's character of tele-



vision fame. Farfel is color fast and can be used either as a tub toy, washcloth or as a regular toy. The item is 7 by 8½ inches in size and comes individually packaged in a polyethylene bag.

Restfoam Economy Cushion

A new foam rubber reversible furniture cushion of improved design and lower price has been announced by Hewitt-Robins Inc., Stamford, Conn. The cushion, called the "Restfoam Economy," is made with a long sweeping flare at the corners to provide maximum cushion fill and at the same time eliminate buckling or "fold back" which sometimes occur in cushions with too-sharp corners. The top and bottom edges are contoured to permit neat tailoring, free of sharp ridges, even when the upholstery fabric is not cut exactly to pattern. The cushion will be available in about 25 different sizes and shapes to fit both period and modern furniture. The thickness will be approximately 3½ inches at the box and 5⅛ inches at the crown.

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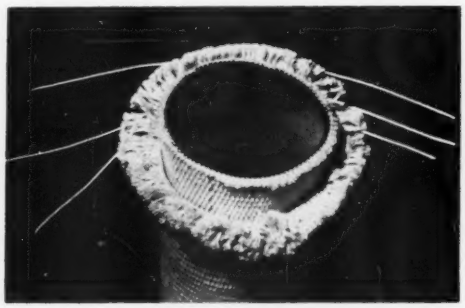
Standard of the World

BWH Glass Fiber Hose

Boston Woven Hose & Rubber Co., Cambridge, Mass., has announced an improvement in the manufacture of light-weight fire hose utilizing the high strength of glass fiber yarn. The new "Boston Fiber Fire Hose" is 20 pounds lighter per 100 feet than conventional cotton hose, and is even lighter than hose made with other synthetic fibers, yet is far stronger. Where a 50-foot length of conventional cotton hose will form a coil approximately 28 inches in diameter, an equivalent length of the new hose forms a coil of only 24 inches in diameter. Still



another advantage, the company states, is that glass fiber yarn, which is specially treated, does not absorb water. As a result the hose when wet is much lighter and remains more flexible at low temperatures. Because of the higher strength imparted by the glass fiber yarn, a hose of conventional outside diameter can be made with thinner wall, thus permitting a larger bore which will handle more gallons of water per minute. The photograph above shows strands of glass fiber protruding from the cut end of the new hose.

Goodrich Refueling Hose

Naval ships can be refueled at sea today faster than ever before with a new larger yet lighterweight oil hose furnished by the B. F. Goodrich Co. Industrial Products Division. The new, larger size hose, which permits higher rates of fuel deliveries has been installed on Navy fuel oil tankers which service fighting ships at sea. The hose has a seven inch diameter as compared with the six inch size, which was the largest that could previously be handled due to weight limitations. According to the company, the new hose weighs no more than the six inch hose when both are filled with oil, despite the increased weight of the fluid column of oil contained in the larger hose. Goodrich credits the use of the rubber company's Flex-seal-end hose, which eliminates heavy metal nipples, for most of the weight reduction. Ends of the new hose are built up and butted tightly together with lightweight flanges. The hose is reinforced with high tension steel wire at points where it is suspended across water by ship's hoists.

Plasti-Guard Co., Chicago, Ill., is distributing new drapery hook protectors made of Krene. The Krene vinyl film forms a tough, flexible shield for the hook's end during the drapery cleaning process. Drapery hooks are inserted through holes in the covers which are strung on a thin tubing made of the same material for strength and resistance to moisture and chemicals.

SPRING LEAF TRUCK

This new Truck gives unobstructed access to three sides of each tray and offers a convenient method for storing materials that require cooling or air drying. The one piece construction Trays are spring supported and can be quickly raised or lowered, free from all locking devices. Trucks having 18 perforated trays 36" x 36" or plain surface trays 36" deep by 4 ft., 6 ft. and 8 ft. long, can be furnished either stationary or mounted on casters.

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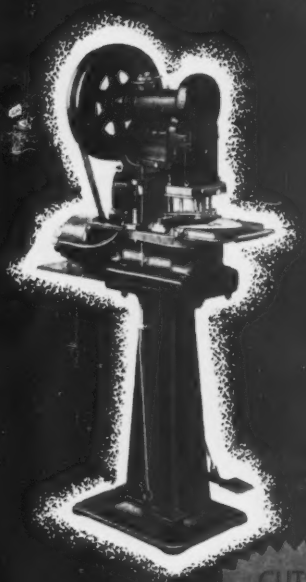

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Andco Auto Arm Rest

A portable arm rest which fits between the back and bottom sections of either the front or back seats of an automobile has been introduced by Andco Foam Rubber Products, Cuyahoga Falls, Ohio. Made of bonded foam rubber, the "Andco Auto Arm" comes in two styles—washable plastic cover in red, blue and green or auto-

motive sidewall fabric in grey, green, brown or blue. The arm rest may be used on either the front or back seat as a safeguard for small children, protecting them against falling toward the doors and from sudden stops and starts.

Develops Improved Acid Hose

Development of a hose highly resistant to a wider range of acids, salts, alkalies and other solutions has been announced by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. According to the manufacturer, this improvement has been made in its "Condor Acid Discharge" and "Condor Acid Suction Hose" by compounding a new special synthetic with other acid-resisting materials for tube and cover. The improved hose withstands many organic and inorganic acids, salts and alkalies, and plating solutions much longer than conventional acid hose, and can be used to convey other solutions previously not recommended for rubber hose. The tube of this hose is also claimed to be highly abrasive-resistant to withstand slurries.

Hewitt-Robins Propane Gas Hose

A new propane gas hose that is highly flexible and light in weight, yet is capable of withstanding working pressures of 350 pounds per square inch, is now being produced by Hewitt-Robins Inc., Stamford, Conn., for tank truck delivery service. The hose is made in lengths of 100, 125 and 150 feet. It is made with a 3-braid reinforced carcass containing a synthetic compound which resists propane permeation. It has a smooth mirror finish neoprene tube and an outer covering of tough synthetic rubber especially compounded to resist weathering, sun checking and oil deterioration. A static wire is built into the carcass to drain off static charges.

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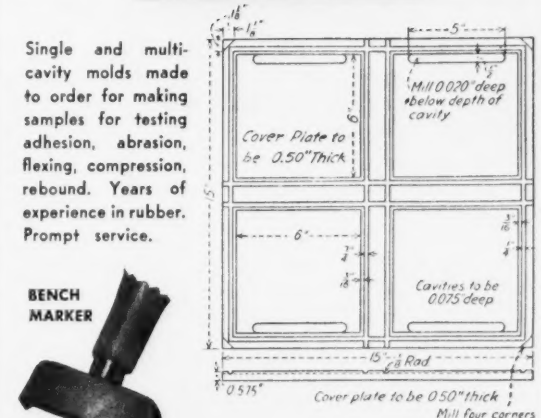
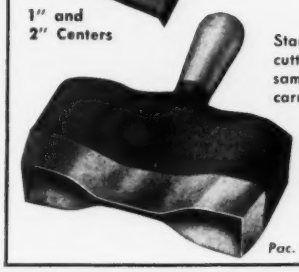

Cover Plate to be 0.50" Thick
Mill 0.020" deep below depth of cavity
Cavities to be 0.075 deep
15 - 1/8 Rad
0.515"
Cover plate to be 0.50" thick
Mill four corners 1/8 deep for prying mold apart

BENCH MARKER

1" and 2" Centers



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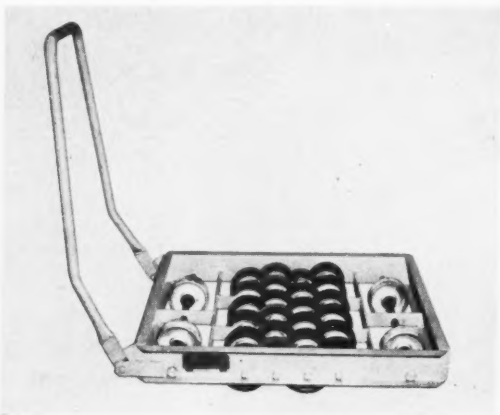
NEW EQUIPMENT

Swivel-King Pallet Roller

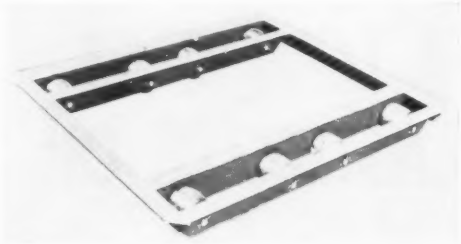
"Ace Swivel King" pallet rollers, developed by the Frank L. Robinson Co., Latham Square Building, Oakland 12, Calif., are said to permit effortless movement of palletized loads in any direction and to any location



needed. The frame of the unit is of high tensile strength steel, fully welded. It has a high pallet bearing area for stability and protection. The rolls are of 3½ inch diameter, easy rolling and crowned for floor protection. Bearings are of a heavy-duty, fully-lubricated type. The axles cannot turn in the frame.

Roll Rite Universal Pallet Dolly

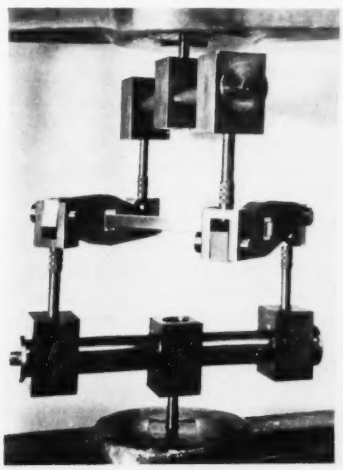
A universal type pallet dolly, which rolls and steers over any type floor without swivel casters, has been introduced by the Roll Rite Corp., 801 Jefferson St., Oakland 7, Calif. Special advantages claimed by the manufacturer include maneuverability, ease of operation and proven ability to roll on rough or slatted floors. Twenty-



four 6-inch wheels support the load and provide surface contact on rough surfaces. These large diameter wheels are said to roll easily under load and are available with rubber treads or aluminum alloy treads to fit operating conditions. The front and rear wheels are mounted on spring-loaded axles to assist in guiding the loaded pallet dolly are available, namely, 30 x 40 inches and 40 x 48 and to allow 360-degree turning. Two sizes of the pallet inches. Larger sizes can be supplied.

Schaevitz Torsion Device

To produce pure torsion on a tension testing machine, the Baldwin - Lima - Hamilton Corp., Philadelphia 42, Penna., has introduced the Schaevitz torsion device. Test specimens up to ¾-inch square and ranging from 2 to 12 inches long (plus 2 inches to be engaged by



torque bars) can be twisted to a maximum angle of 24 degrees. Maximum torque load is 60,000 inch-pounds, obtained by applying a 12,000-lb. tension load. The new Schaevitz torsion device is furnished with hardened socket liners for specimens ⅜-inch, ½-inch, ⅝-inch, and ¾-inch square or for round specimens with square ends of these sizes. Other sizes of liners are available on special order. Ends of test specimens are secured in the centers of two parallel torque bars. Torque bars are rotated in opposite directions by means of four tension members that are pivotally connected in the ends of two equalizer bars. Pivotal connections are provided also for the two spherically-headed tension rods that are seated in wedge block adapters in the testing machine crossheads.

Troubles?
SEE PAGE 4

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The **Ashcroft Maxisafe Duraguage** produced by Manning, Maxwell & Moore, Inc., Stratford, Conn., combines absolute protection to the viewer with easy entree to the entire gauge movement and tube assembly for inspection, recalibration or repair. Pressure ranges include 15 psi or vacuum minimum to 100,000 psi maximum.

A combination **carton and drum clamp** which can handle both types of containers without the use of skid or pallet has been introduced by the Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, Ohio. The clamp is adaptable to all Elwell-Parker center-control, sit-down fork trucks, both gas and electric-powered types.

Capable of sensing any system pressure over an adjustable range from 15 to 3000 psi and actuating an electrical circuit on increasing or decreasing pressure, a new inexpensive **heavy-duty pressure switch** is being marketed by Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58, Calif. The piston type pressure sensing element used is not subject to fatigue and is well suited for applications where millions of cycles are expected of the switch.

A radically new approach to centrifugal pump design that practically eliminates pump maintenance features a new **fractional horsepower model Chempump** recently introduced by the Chempump Corp., 1300 E. Mermaid Lane, Philadelphia 18, Penna. The new unit is a seal-less, leakproof pump, which is totally enclosed from the atmosphere.

Elwell-Parker Electric Co., Cleveland 3, Ohio, has developed a compact **hydraulically-operated load-revolving mechanism,** for use on its various types of hydraulic fork trucks. The unit, which permits 360° rotation, is designed for use in conjunction with fork truck attachments, including forks, roll paper clamps, up-enders and other load-supporting devices. Trucks so equipped are specially suited for discharging contents from skid bins and other containers, for positioning loads for storage, and for maximum ease of handling during loading and unloading.

Single and multiple edge cutters are used as tools, while multiple edge cutters are generally used for pre-roughing the forms. Single edge cutters made from high speed steel are used for finish milling. These cutters are said to possess strong edges, stand up against varying loads, can be quickly reground to any desired profile. Customary coolants can be used with normal speeds.

A precise new valve designed to allow flow in one direction up to a pre-determined rate but shut off quickly and tightly to prevent higher flows, while allowing unrestricted flow in the opposite direction, has been developed by James-Pond-Clark of Pasadena, Calif. Designed as an **excess flow or flow limiter valve,** it can be pre-set to close off when any given flow rate is reached.

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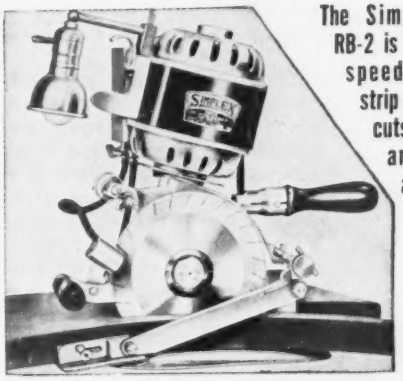
CUT 2500 FEET OF STRIP PER HOUR



The Simplex Model RB-2 is a new high-speed, portable strip cutter that cuts efficiently and accurately.

The new Model RB-2 has a maximum cutting thickness of two inches, weighs 44.5 pounds, and is available in both A.C. and D.C. types. Manually operated, the machine is capable of cutting up to 20,000 feet of rubber strip in eight hours. A series of slits in the edge of the cutting blade carries water from a reservoir into the cut and not just to the top of the rubber being cut. This method lubricates the entire cut and produces a straight and even edge.

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THE STAMFORD RUBBER SUPPLY COMPANY
Stamford, Conn.

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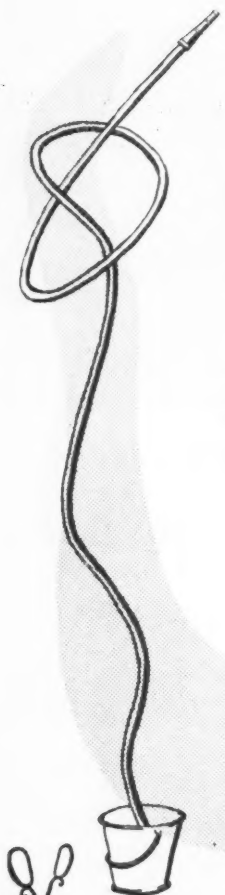
FOR CLEAR VINYL GARDEN HOSE



Yes, rigid control of clarity and color for clear vinyl garden hose or any transparent extruded vinyl tubing is now possible with Stabilizer Mark XV. This economical stabilizer assures perfect heat and light stability and imparts superb weather-resisting characteristics to the vinyl. And, where cost is a factor, Mark XV increases the heat stability of lead-stabilized compounds.

In easy-to-handle liquid form, Mark XV mixes quickly and thoroughly. Try it! Send for a generous working sample today.

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ARGUS

CHEMICAL LABORATORY

633 Court Street, Brooklyn 31, N. Y.

Limitations of Synthetic Packings

(Continued from Page 90)

600%. Tear strength has been improved from 40 pounds per inch to over 100 pounds per inch. Abrasion resistance is significantly improved, and by the use of better curing agents resistance to compression set has been increased. It is understood that at least one of the large silicone gum manufacturers is working on the problem of increased oil and fuel resistance. When this development is released, the hydraulics industry will have the heat resistance of silicone to help meet their problems.

Vulcollan—In the way of future possibilities, news of the development of a new synthetic rubber by the firm of Farben Fabrik Bayer of West Germany *(2)* is of interest. United States sources agree that the new material, called "Vulcollan," will provide a tire which will outlast most automobiles. A rubber with the necessary physical properties for such a statement will certainly find applications in the hydraulic and pneumatic fields.

New Elastomers and Compounding Ingredients—The development of a new base polymer of practical worth is no mean accomplishment. Chemically and physically, the molecular and structural requirements for an elastomer are infinitely more complex than most "plastic" systems.

As evidence of this, there are only eight major different types of elastomers of commercial value known. Though it is dangerous to predict the future, it would seem reasonably safe to state that in spite of extensive work being done at this time to develop new and better polymers of the elastomeric type, the complete solution to hydraulic and/or pneumatic rubber problems with high temperatures is many years off. It would seem that the major portion of work to develop better rubber will fall to the rubber compounder working with the materials already available but using new compounding ingredients other than the base polymer.

Aside from a new polymer, a new plasticizer would contribute to the improvement of high temperature rubber for hydraulic applications. As has been mentioned, the same di-ester type oils now being used as aircraft lubricants are presently the only rubber plasticizers with which the —65°F. low temperature requirement can be met. If an oil with a very high boiling point can be found which will impart low temperature flexibility to high acrylonitrile type Buna N rubber when used in small quantities, the rubber compounder would have a very valuable new tool.

New antioxidants, which will inhibit aging at higher temperatures, also present interesting possibilities.

LITERATURE REFERENCES

(1) Schmidt and Marlies, "Principles of High-Polymer Theory and Practice," McGraw-Hill Book Co., New York, 1948.

(2) Anon., *India Rubber Journal.*

Specialties, Inc., Syosset, L. I., N. Y., has announced the **Electrostatic Locator,** Type D, for the location of electrostatic charges and induction. This portable instrument weighs less than 4 pounds and contains its own source of power.

New **speed recorders** for obtaining permanent speed records with dependability, economy and convenience otherwise unavailable in a panel-mount instrument, have been announced by the Metron Instrument Co., Denver, Colo.

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- GR-S Latex Concentrate
- Natural and Synthetic Latex Compounds
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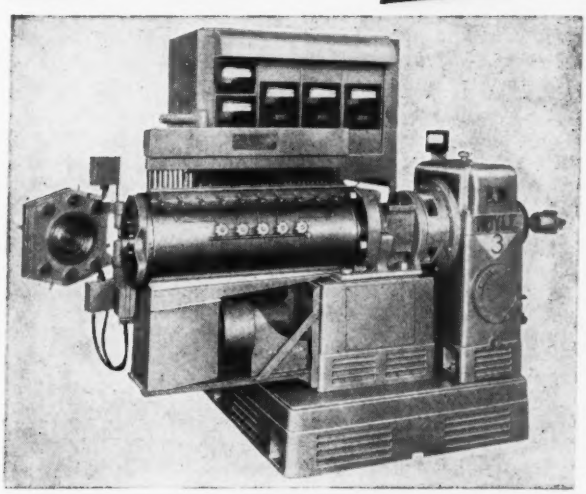

Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

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REVIEWS

BOOKS

The Handbook of Solvents. By Leopold Scheflan and Morris Jacobs. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. 6½ x 9½ in. 728 pp. $10.00.

This comprehensive handbook covers various theoretical and practical attributes of solvents, solvent recovery, and the physical properties of over 2700 liquid organic compounds arranged under multiple headings for quick and positive reference. The first portion of the book covers such theoretical and practical aspects as solvent action, solvent power, vapor pressure, evaporation rates, dilution rates, the limits of inflammability and safe practices in the use of solvents. Solvent recovery, of direct interest to the rubber field, is discussed in considerable detail with much helpful bibliographical material. The second portion consists of a survey of the "constants" of commercial solvents as sold and data on substances which may become important commercial solvents in the future. Not only can "actual constants" be located, but information also may be found under compound name and by synonym. Included is data on formula, weight, melting point, range, viscosity, surface tension, etc. The solubility of water in solvents and solvents in water is contained in a special section. Adding to the value of the handbook is the inclusion of a number of tables, an index of synonyms, and a general index. This new handbook is a most useful contribution to the literature of solvents.

•

Symposium on Conditioning and Weathering. (Technical Publication No. 133). Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. 6 x 9 in. 104 pp. Heavy Paper Cover. $2.25.

A Symposium on Conditioning and Weathering was held during the 1952 Annual Meeting of the society under the sponsorship of Committee E-1 on Methods of Testing. Ten papers were presented covering a variety of materials which are affected to some extent by atmospheric influences. All ten of the papers, as well as subsequent discussion, are reproduced in this booklet. Among specific materials covered by the papers are textiles, paper, adhesives, plastics, organic coatings, and metallic coatings. Other papers are devoted to fundamentals of atmospheric elements, air conditioning for the laboratory, moisture resistance tests, outdoor exposure testing on racks and test fences, and accelerated weathering devices. An introduction to the symposium by Robert Burns of the Bell Telephone Laboratories, who presided over the session, is also included.

•

Standards on Electrical Insulation Materials: 1953. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. 6 x 9 in. 590 pp. Heavy Paper Cover. $5.25.

The 1953 edition of this compilation, prepared by ASTM Committee D-9 on Electrical Insulating Materials, contains in their latest approved form 75 widely used ASTM standards, including 56 test methods, 16 specifications, 2 recommended practices, and a list of definitions with procedures relating to conditioning and weathering. Among products covered by the standards are rubber tape and electrical protective equipment, insulating fabrics, plastics for electrical insulation, and insulating shellac and varnish. Appendices cover the significance of tests of electrical insulating materials and proposed recommendations for writing statements as to the usefulness of tests of such materials. An innovation in the 1953 edition is the use of Bible paper, which provides a substantial reduction in bulk of the book, making it a compact volume of convenient size.

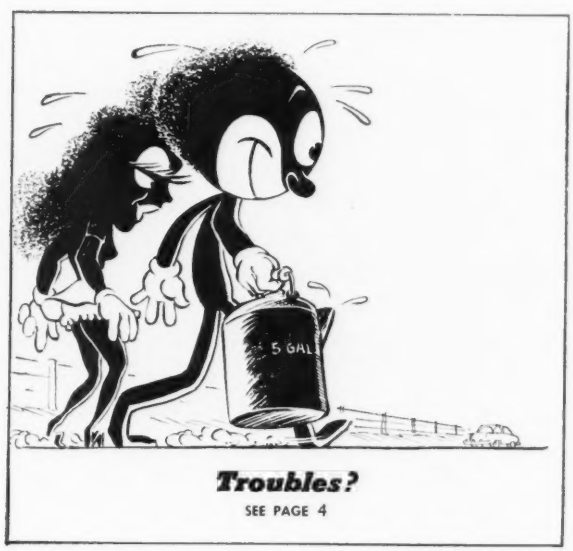
Review of Current Research and Directory of Member Institutions: 1953. Published by the Engineering College Research Council of the American Society for Engineering Education (Secretary: V. E. Neilly, 103 Mechanical Engineering, Pennsylvania State College, State College, Penna.). 6 x 9 in. 330 pp. $2.50.

Over 100 institutions are members of the Engineering College Research Council, including all major engineering schools in the United States. Some 7500 research projects are in the hands of these institutions, and more than 13,000 people are engaged in them, including faculty, graduate students and research engineers. The research expenditures involve approximately $65,000,000 annually, with practically all branches of engineering covered in one or more of the projects. Some facts and figures on the numerous projects involved are given in the latest edition of this review which is issued on a biennial basis. The review lists all current research projects in the hands of member institutions by titles and contains information on the responsible administrative officers, policies which govern research projects and contracts, personnel engaged in research activities, annual expenditures for research projects, sources of income for research, and special conferences and short courses of interest to research workers.

•

Stewart's Scientific Dictionary. (4th Edition). By Jeffrey R. Stewart. Published by the Stewart Research Laboratory, "Forest Gate" at Franconia, Alexandria, Va. 6¼ x 9¼ in. 788 pp. $10.50.

The purpose of this reference volume is to provide authentic, concise, and practical information of interest to manufacturers, educational institutions, industrial consumers, and all those concerned with the materials used by the various chemical process industries. This new edition includes many terms which have appeared since the first three editions, as well as some terms which were inadvertently omitted. The style and the format of this new edition have also been improved in an effort to comply with suggestions emanating from the various chemical process industries. In view of the fact that there is such a great overlapping and interdependence among the various industries, this edition attempts to integrate and embrace all of the terms used in these industries. Both suppliers and consumers will find this new scientific dictionary a valuable reference work.



Troubles?

SEE PAGE 4

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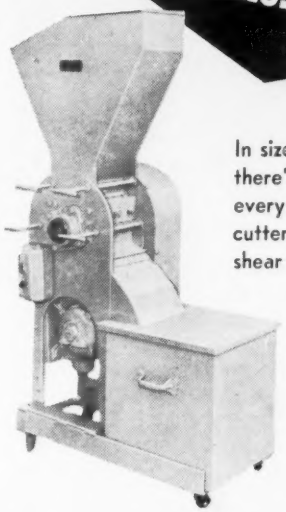

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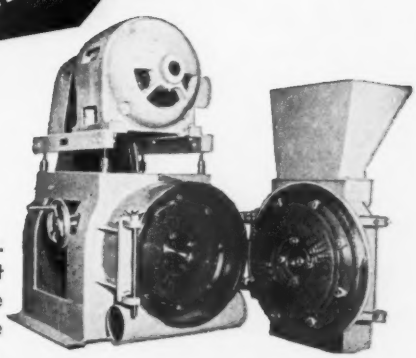

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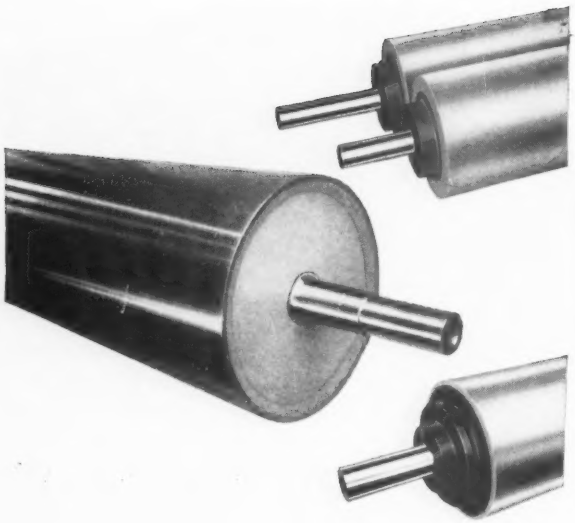

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Measuring Equipment for Laboratory and Production Testing. (GEC-1016A). General Electric Co., Schenectady 5, N. Y. 8½ x 11 in. 64 pp.

This is the second edition of the company's measuring equipment catalog, containing information on more than 115 testing and measuring devices for laboratory and production line use. Fully illustrated, the publication contains information on products ranging from simple current indicators to completely automatic oscillographs, from surface roughness scales to mass spectrometers, and from D.C. amplifiers to radiation monitors. The purpose of the catalog is to bring to the attention of its users the many measuring devices that can be used to increase the efficiency of their operations. A brief description of each product and its field of application, condensed tables of important characteristics and prices indicate whether or not the device is suited for a specific job.

•

Miracles of Research. Goodyear Tire & Rubber Co., Akron 16, Ohio. 6 x 9 in. 48 pp.

This interesting booklet marks the 10th anniversary of the Goodyear Research Laboratory and reviews the accomplishments of this laboratory during the past ten years. The manner in which the laboratory contributed to the development of synthetic rubber is recounted while continuing work on "cold rubber", oil-enriched rubber and the new polyester rubber is discussed. Also covered is the work the laboratory has been doing in textile research, vinyls, chemicals, and in end-products for home and industry. Illustrated with photographs, the booklet covers a particularly interesting portion of the history of rubber in that the period discussed includes the developments of World War II and the Korean conflict.

•

Belt Conveyor Idlers. (Book 2416). Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. 8½ x 11 in. 48 pp.

More than 500 belt conveyor idlers in 34 types, designed to meet practically every requirement, are pictured and described in this new catalog. Light, medium and heavy duty 20-degree troughing idlers, flat belt, belt training, rubber cushion and the new Link-Belt variable troughing idlers are included, all in a broad range of roll diameters and belt widths, together with return belt idlers and such accessories as idler stands, grease pipe extensions and a grease seal and bearing extractor. Detailed information is provided for selection and spacing, based on weight and lump size of material to be conveyed. Schematic drawings and dimensional data are included for each type of idler.

•

Askania Edge Position Control for Every Web Guiding Job. (Bulletin No. 161). Askania Regulator Co., 240 E. Ontario St., Chicago 11, Ill. 8½ x 11 in. 12 pp.

Included in this bulletin are photos and diagrams which explain the Askania Edge Position Control System, types of models, and applications in the rubber, plastics, paper, foils and metals processing fields. It is explained that this control system may be used in any web-handling operation, with any material handled in webs. Nothing but a breath of air is said to touch the controlled web edge.

•

Rapid Composition Analysis of Commercial Stearic Acids. (Technical Bulletin No. 43). Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio. 9 x 11½ in. 12 pp.

A simplified procedure for determining the composition of commercial stearic and palmitic acids is discussed in this publication. Based on titer and iodine value tests only, the method is claimed to provide an accuracy within 1½%. This is compared to an accuracy of 1% normally obtained by more complex fractional distillation methods. The test procedure and necessary curves are outlined in the bulletin.

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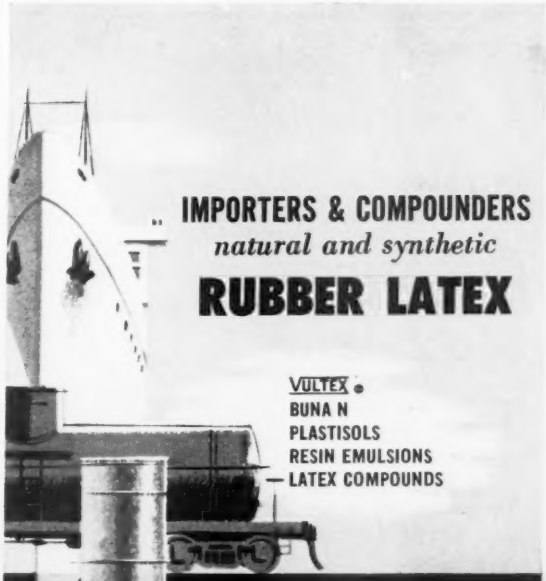

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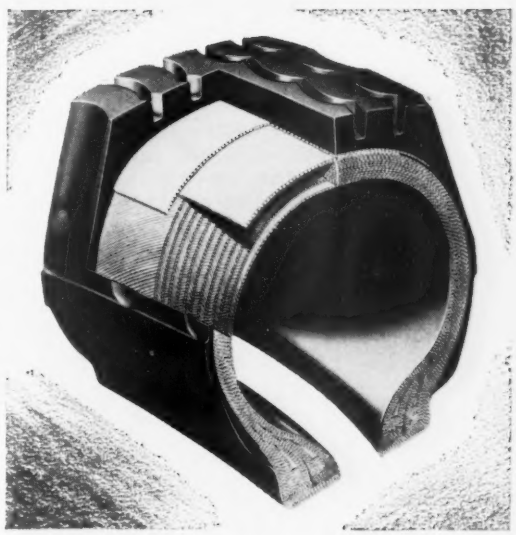

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For Uniform Particle Size Cut Rubber Stock With...

TAYLOR-STILES RUBBER CUTTERS

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(Index No. App. 202)

which contains information about the specialized cutters we furnish to many manufacturers of rubber products. Included are:

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CUTTING MACHINES & KNIVES

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REVIEWS (CONT'D)

Witcote No. 820 Cork Insulation. (Bulletin 53-4). Pioneer Asphalt Division, Witco Chemical Co., 75 East Wacker Drive, Chicago 1, Ill. 8½ x 11 in. 8 pp.

The composition, application and uses of Witcote No. 820 Cork Insulation are outlined in this new bulletin which describes the product as being a cold-application fluid type of material composed of highly efficient insulating fillers of cork and asbestos and a bituminous base possessing unusual adhesive, waterproofing and corrosion-proofing qualities. It is applied directly from the drum by hand-operated spray guns. Complete data as to proper thickness and coverage are given as well as its qualifications for waterproofing and seam sealing, vibration dampening, sound deadening, insulating, etc.

•

Turba-Film Evaporator. (Catalog No. 353). Rodney Hunt Machine Co., 43 Vale St., Orange, Mass. 8½ x 11 in. 12 pp.

This two-color bulletin on the "Turba-Film" evaporator contains charts and pictures which describe the use, dimensions and operation of the unit. Details of all five production models as well as the portable laboratory unit are included in the booklet. This new stainless steel evaporator concentrates, distills, deodorizes, degasses, de-aerates, heats, cools or otherwise processes liquids, gases and slurries in a few seconds by continuous operation.

•

Photoelectric Side Register Control Systems. (Bulletin GEA-5947). General Electric Co., Schenectady 5, N. Y. 8½ x 11 in. 8 pp.

Photoelectric side register control systems, how they operate and what they do, are described in this two-color bulletin. The publication explains the "two-point" and "proportional" register systems which are used on slitting, rewinding, side-trimming, and printing operations. Operational drawings show the various uses and features of the different systems. Component parts and various installations are photographically presented.

•

Steelflex Couplings. (Bulletin 4100). Falk Corp., 3029 W. Canal St., Milwaukee 8, Wisc. 8½ x 11 in. 28 pp.

This interesting bulletin consolidates all information about all the "Steelflex Couplings" produced by the company. The bulletin provides a complete index to all the various types of couplings offered as well as complete instructions on methods of selection. Tabular data is provided which offers a formula method for selecting Steelflex Couplings for motor and turbine drives. Subsequent sections contain detailed data on many different types of couplings.

•

Rubber Plate Manual for the Graphic Arts. Roto-Type Corp., 36-41 36th St., Long Island City 6, N. Y. 7 x 9 in. 24 pp.

Of particular interest to those using rubber printing plates or for those who would like to know what is being done with rubber in the graphic arts, this publication describes the company's activities with non-metallic printing plates. Replete with technical data on the printing arts, this publication contains data on inks and general suggestions as to the use of these new printer's tools.

•

Meters and Controls. (Bulletin 18). Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10, Ohio. 8½ x 11 in. 16 pp.

This comprehensive catalog offers information on the complete line of meters, control equipment and engineering services of the company. It is written for engineers in power plants, public utilities, and process plants. Fifteen measured variables common to power and process operations form the index for selecting appropriate metering and control equipment. Basic specifications, illustrations, and detailed literature references are included.

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MARKETS

NEWS-PRICES

NEW YORK, OCT. 14, 1953

Raw Rubber

Natural: Since our last report (September 15), the average price of spot rubber on the New York Commodity Exchange has moved in a range of 2.87c, high for the period being 23.25c reached on September 16, and low being 20.38c reached on October 14. The average price of spot rubber for the month of September was 23.06c based on 21 trading days. This compares with an average of 23.36c in the previous month.

It does not appear as though anyone in the trade has visualized a slump in natural rubber prices as severe and as rapid as has taken place in the last few weeks. The statistical position of natural rubber continues to deteriorate. Prices at London, during the period, went down to the lowest levels since April 4, 1950, while New York and Singapore both registered new lows since the last week of March, 1950.

The decline in consumption in July and August was attributed, in some part, to a decline in demand from Russia and China. Imports into Russia in the first quarter of this year were nearly 29,000 tons; in the second quarter they were 12,000, while in July and August combined they were only 500 tons.

Imports into China in the first quarter of this year were 6,000 tons and in the second quarter 5,000 tons, while in July and August there were only 2,250 tons imported. In the first eight months of this year, Russia imported 41,250 tons and China imported 32,250 tons.

Synthetic: It would normally be expected that with natural rubber selling at a lower level than synthetic, consumption of that latter material might show an appreciable decline. This has not been the case, however. The U. S. Department of Commerce reports that 58,437 long tons of all types of synthetic rubber were consumed in August, only about 2,000 long tons less than were consumed in the previous month.

The new RFC sales policy for dry GR-S, described elsewhere in this issue, has evoked sharp comment from abroad. In commenting on the RFC move, the London *Financial Times* observed that the avowed aim of this policy is to prevent the sudden cancellation of contracts and a switch to natural rubber when the price of the latter is more attractive, as it is at present.

This decision, said the publication, is bound to throw doubt on the willingness of the Americans to allow the synthetic product to complete freely with natural rubber under more equal conditions. The crucial period for the natural rubber industry, notes the London journal, will be the next eighteen months while the synthetic industry remains under the control of RFC. This latest move by RFC, declares the *Financial Times*, suggests that the promises of a more competitive market made at Copenhagen may not be kept.

Price Data

Closing Rubber Prices on New York Commodity Exchange (No. 1 R.S.S. Contract)

FROM SEPTEMBER 16 TO OCTOBER 14

Sept.	Spot	Dec.	Mar.	May	July	Sales
16	23.25	23.15	23.15	23.10	23.10	0
17	23.12	23.10	23.10	23.10	23.10	0
18	23.12	23.10	23.10	23.10	23.10	0
16						
20						
21	23.00	22.91	22.90	22.80	22.80	27
22	22.88	22.80	22.80	22.75	22.75	5
23	22.75	22.50	22.40	22.40	22.40	122
24	22.75	22.75	22.65	22.60	22.60	52
25	22.75	22.70	22.65	22.60	22.60	1
26						
27						
28	22.75	22.66	22.65	22.65	22.65	11
29	22.62	22.67	22.55	22.55	22.55	50
30	22.62	22.60	22.60	22.50	22.50	5
Oct.						
1	22.62	22.60	22.60	22.60	22.60	3
2	22.62	22.55	22.45	22.45	22.40	10
3						
4						
5	21.62	21.60	21.50	21.50	21.50	42
6	21.50	21.45	21.50	21.50	21.50	83
7	20.88	20.80	20.85	20.80	20.80	101
8	21.25	21.20	21.25	21.25	21.25	95
9	20.75	20.60	20.75	20.75	20.75	92
10						
11						
12						
13	20.75	19.90	20.01	20.00	19.90	49
15	20.38	20.15	20.25	20.25	20.25	13

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.20⅜
November	.20⅜
December	.20⅜
Thin Latex Crepe:	
Spot	.22¾
Thin Brown Crepe, No. 2	.17⅛
Smoked Blankets	.16¾
Flat Bark Crepe	.15¼

London Market

(Standard Smoked Sheets)

November	19.54 - 19.69
Jan. - Mar.	19.83 - 19.88

Singapore Market

(Standard Smoked Sheets)

November	18.30 - 1841

Synthetic Rubber

(Dry Types—Per Pound)

Butaprene NF	.490	- .500
Butaprene NL	.500	- .510
Butaprene NAA	.540	- .550
Butaprene NXM	.580	- .590
Chemigum 30N4NS	.500	- .510
Chemigum 50N4NS	.500	- .510
Chemigum N3	.580	- .590
G-E Silicone Rubber (compounded)	3.15	-4.00
G-E Silicone Gum (not compounded)	——	-4.48
GR-I	——	- .220
GR-S	——	- .230
Hycar OR-15	.580	- .590
Hycar OR-25	.500	- .510
Hycar OS-10	.550	- .560
Neoprene Types AC and CG	——	- .550
Neoprene Type GN	——	- .410
Neoprene Type GN-A	——	- .410
Neoprene Type GRT	——	- .420
Neoprene Type KNR	——	- .750
Neoprene Type Q	——	-1.00
Neoprene Type S	——	- .420
Neoprene Type W	——	- .410
Neoprene Type WRT	——	- .450
Paracril B	.500	- .510
Paracril BJ	.500	- .510
Paracril C	.580	- .590
Silastic (compounded)	2.35	-4.40
Thiokol Type A	——	- .470
Thiokol Type FA	——	- .640
Thiokol PR-1	——	- .950
Thiokol Type ST	——	-1.000

Middling Upland Quotations

	Sept. 15	Oct. 14		
	Close	High	Low	Close
Oct.	33.11	32.50	32.42	32.46
Dec.	33.36	32.80	32.73	32.71
Mar.	33.71	33.22	33.12	33.11

Liquid Latex

Natural: According to Latex & Rubber, Inc., July and August estimates of Hevea latex consumption in the United State indicate a further decline in consumption. Whereas in the first four months of 1953 an average of 6,000 tons were used each month, the next four months will show an average of perhaps 5,200 tons per month.

Estimates for the remainder of this year show that consumers are planning to use Hevea at the rate of about 5,500 tons per month. Estimates for early 1954 usage show an increase over last quarter 1953 usage to average at about 5,700 tons.

The build-up of large inventories in the United States is attributed not only to lower July and August ussage, but to the fact that they have been built as a hedge against labor difficulties in Indonesia and possibilities of a dock strike on the Atlantic Coast. Current prices range between 31 and 32c per pound.

Synthetic: The Commerce Department estimates that in the first eight months of 1953, 31,683 long tons of GR-S latices were produced, while 6,105 long tons of neoprene latices and 3,087 long tons of N-type latices were produced. Consumption in the same period was set at 32,201 long tons of GR-S latex, 5,528 long tons of neoprene latex and 2,604 long tons of N-type latex.

The Department estimates that as of August 31, there were 5,253 long tons of GR-S latex on hand, while at the same time there were 1,123 long tons of neoprene latex and 570 long tons of N-type latex on hand.

In August, 3,058 long tons of GR-S latex were produced, 753 long tons of neoprene latex and 633 long tons of N-type. In the same month, 3,007 long tons of GR-S latex, 682 long tons of neoprene latex and 352 of N-type latex were consumed.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the rather narrow range of .40c since our last report (September 15), high for the period being 33.75c reached on September 28, and low being 33.35c reached on October 5, 6, 8 and 9. The average price of middling uplands for the month of September was 33.69c based on 21 trading days. This compares with an average of 33.82c in the previous month.

A proposal for a world agreement to stabilize cotton prices and production has drawn criticism from the International Cotton Committee, which recently ended a three-day conference in Copenhagen. The group held in a resolution adopted unanimously that the proposed terms for the agreement probably would restrict development of the raw cotton trade and maintain prices at an uncompetitive level.

The United States government, on October 8, estimated this year's cotton crop at 15,596,000 bales, a level that will require a vote by growers on whether they want production controls on next year's crop. Secretary of Agriculture Benson is expected to proclaim marketing quotas on the 1954 crop momentarily. The indicated crop, coupled with reserves from past crops, will create a surplus supply under terms of farm law requiring the production controls, subject to grower approval. The controls question will be submitted to the farmers at a referendum to be held on December 15. Approval by at least two-thirds of the growers voting would be required to make the controls operative.

MARKETS

NEWS-PRICES

NEW YORK, OCT. 14, 1953

Reclaimed Rubber

According to preliminary estimates by the U. S. Department of Commerce, 22,593 long tons of reclaimed rubber were produced in August, while 265 long tons were imported for a total new supply of 22,858 long tons. In the previous month, the total new supply ran to 23,292 long tons.

The Department estimates that 22,322 long tons were consumed in August, and 885 long tons exported. Stocks on hand at the end of the month totaled 30,210 long tons. Production for the first eight months of 1953 amounted to 206,318 long tons, while consumption was set at 198,857 long tons.

Reclaimers report that trade during the past month has been rather slow. This is attributed to the fact that manufacturers are reducing their inventories with the approach of the year-end. It is expected that business will show some upturn after the first of the new year. Current prices follow:

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.10½
First Line Whole Tire	.10
Second Line Whole Tire	.09½
Third Line Whole Tire	.09¼
Fourth Line Whole Tire	.08¾
Black Carcass	.14¼
No. 1 Light Colored Carcass	.20¾
No. 1 Select Peel	.11¾
No. 1 Peel	.10½
Butyl Tube Reclaim	.12½
S.P. Natural Rubber Black Tube	.16
Natural Rubber Black Tube	.15
Natural Rubber Red Tube	.24¼
Natural Rubber Gray Tube	.24¼

Tire Fabrics

Preliminary figures compiled by the Bureau of the Census indicate that 140,338,000 pounds of tire cord and fabrics of all types were produced in the second quarter of 1952. The total figure included 21,593,000 pounds of cotton tire cord and fabric, and 118,745,000 pounds of rayon and nylon tire cord and fabric. In the preceding quarter, 136,158,000 pounds of tire cord and fabric were produced, including 19,855,000 pounds of cotton tire cord and fabric and 116,303,000 pounds of rayon and nylon cord and fabrics.

While nylon cord and fabric have been making increasing inroads in this field, the recent introduction of newer and stronger rayon types, such as DuPont's "Super Cordura" and Rayonier's "Rayocord-X", indicates that a greater area of competition may yet develop between the two materials. Current prices follow:

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.76½
1650	lb.	.73½
2200	lb.	.73

Nylon Tire Cord

210	lb.	2.00
840	lb.	2.00

Rayon Graded Fabric

1100	lb.	.72
1650	lb.	.69½
2200	lb.	.68½

Cotton Chafers

14.4 oz. (per square yard)	lb.	.72
9.25 oz. (per square yard)	lb.	.67½
11.65 oz. (per square yard)	lb.	.64
8.9 oz. (per square yard)	lb.	.69

Scrap Rubber

The U. S. Department of Commerce reports that 1,061 long tons of scrap rubber valued at $59,152 were exported during the month of June. This compares with the previous month when 1,245 long tons of scrap rubber, valued at $67,727, were exported.

Orders for scrap rubber placed by reclaimers for October delivery were not sufficient to cause any great upsurge in activity. Scrap dealers indicate that business is still slow and as an example cited the fact that during the past period one reclaimer has been absorbing most offerings of No. 1 mixed peelings. Trade sources do not tend to see any major change in the situation before the year-end. Current prices follow:

(Prices Delivered Akron)

Mixed tires	ton	14.00
Light colored carcass	lb.	.04¼
No. 1 peelings	ton	45.00
No. 2 peelings	ton	30.00
No. 3 peelings	ton	24.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	16.00
Passenger S.A.G.	ton	15.00
Natural Rubber Red Tubes	lb.	.11¼
Natural Rubber Black Tubes	lb.	.04¼
Butyl Rubber Tubes	lb.	.02½

Rubber

Natural – Synthetic

S. J. PIKE & CO., INC.

30 CHURCH STREET, NEW YORK 7, N. Y.

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In Akron:
Tanney-Costello, Inc.
868 E. Tallmadge Ave.
Blackstone 4148

In California:
Merit Western Co.
George Steinbach
717 So. Date Avenue
Alhambra, California
Cumberland 3-1400

CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

OCTOBER 9, 1953

Prices are, in general, f.o.b. works. Range of prices indicates grade or quantity variations.

Abbreviations: bbls., barrels; c.l., carlot; cyl., cylinder; dlvd., delivered; dms., drums; l.c.l., less than carlot; M.B., masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

*For Export Only

The arrangement of this section closely follows the Chemical Section of the 1953-54 RUBBER RED BOOK. Readers are referred to the RUBBER RED BOOK for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)	lb.	.50	.57
A-32	lb.	.66	.80
A-100	lb.	.52	.66
Accelerator No. 8	lb.	—	1.01½
Accelerator—49	lb.	.53	.54
Accelerator—552	lb.	—	2.25
Accelerator—808	lb.	.66	.68
Accelerator—833	lb.	1.17	1.19
Altax	lb.	.48	.50
Ancap *	lb.	.38	.40
Ancatax *	lb.	.48	.50
Ancazate * BU (ET & ME)	lb.	—	1.04
Ancazide * ET	lb.	—	1.04
ME	lb.	—	1.14
Arazate	lb.	—	2.25
Beutene	lb.	.66	.68
Bismate, Rodform	lb.	—	3.00
Butasan	lb.	—	1.04
Butazate	lb.	—	1.04
Butyl Accelerator 21	lb.	—	.89
Butyl Eight	lb.	1.10	1.35
Captax	lb.	.38	.40
C-P-B	lb.	—	1.95
Cumate, Rodform	lb.	—	1.45
Dibenzo G-M-F	lb.	—	2.60
Diorthotolylguanidine	lb.	.57	.58
Diphenylguanidine	lb.	.48	.49
El-Sixty	lb.	.50	.57
Ethasan	lb.	—	1.04
Ethazate	lb.	—	1.04
Ethyl Thiurad	lb.	—	1.04
Ethyl Tuex	lb.	—	1.04
Ethylac	lb.	.93	.95
G-M-F	lb.	—	2.60
Guantal	lb.	.57	.64
Harvex	lb.	.62	.68
Hepteen	lb.	.44	.46
Base	lb.	—	1.85
Kure-Blend MT	lb.	—	.70
Ledate, Rodform	lb.	—	1.04
MBT-XXX	lb.	.49	.51
Merac	gal.	.75	1.05
Mercaptobenzothiazole	lb.	.38	.40
Mercaptobenzothiazyl Disulfide	lb.	.48	.50
Mertax	lb.	.49	.56
Methasan	lb.	—	1.04
Methazate	lb.	—	1.04
Monex	lb.	—	1.14
Mono Thiurad	lb.	—	1.14
Morfex	lb.	.65	.67
2-MT	lb.	—	.77½
NA-22 (for neoprene)	lb.	—	1.50
NOBS No. 1	lb.	.69	.71
O-X-A-F	lb.	.49	.51
Pentex	lb.	—	1.04
Flour	lb.	—	.21
Permalux (for neoprene)	lb.	—	2.17
Phenex	lb.	.52	.57
Pip-Pip	lb.	—	2.25
R-2 Crystals	lb.	—	2.45
Rotax	lb.	.49	.51
RZ-50	lb.	—	1.00
B	lb.	—	1.00
SA 52	lb.	—	1.14
SA 57	lb.	—	1.04
SA 62	lb.	—	1.04
SA 66	lb.	—	2.50
SA 67	lb.	—	1.04
SA 77	lb.	—	1.04
Santocure	lb.	.69	.76
Selenac (Ethyl, Methyl)	lb.	—	2.50
Setsit-5	lb.	.75	1.05
SPDX-GH	lb.	.64	.69
GL	lb.	—	.95
Tellurac	lb.	—	1.45
Tepidone	lb.	.45	.48
Tetrone A	lb.	—	1.91
Thiofide	lb.	.48	.55
S	lb.	.51	.58
Thionex	lb.	—	1.14
Thiotax	lb.	.38	.45
Thiurad	lb.	—	1.14
Thiuram E	lb.	—	1.04
M	lb.	—	1.14
Trimene	lb.	.56	.58
Base	lb.	1.03	1.06
Tuads, Ethyl	lb.	—	1.04
Tuads, Methyl	lb.	—	1.14
Tuex	lb.	—	1.14
Ultex	lb.	1.00	1.10
Unads	lb.	—	1.13½
Vulcacure NB	lb.	—	.45
ZB	lb.	—	.85
ZE	lb.	—	.85
ZM	lb.	—	.85
Z-B-X	lb.	—	2.45
Zenite	lb.	.48	.50
A	lb.	.57	.59
Zenite Special	lb.	.49	.51
Zetax (uncoated)	lb.	.49	.51
Zimate, Butyl	lb.	—	1.04
Zimate, Ethyl	lb.	—	1.04
Zimate, Methyl	lb.	—	1.04

ACTIVATORS

Blue Lead Sublimed (dlvd.)	lb.	.14¾	.15¾
Fish Oil, Hydrogenated, Fatty Acid			
Hydrofol Acid (dlvd.)	lb.	.10	.15½
Hyfac 430 (dlvd.)	lb.	.13¾	.15½
Neo-Fat H.F.O. (dlvd.)	lb.	.14½	.15¾
Stearex Beads (dlvd.)	lb.	.09	.10¾
Lime, Hydrated			
Arrowhead	ton	—	20.50
Marblehead	ton	—	16.00
Sierra	ton	—	22.00
Litharge			
Eagle-Picher	lb.	—	.16
SB (dlvd.)	lb.	—	.16
Magnesium Oxide, Heavy			
General Magnesite 500	lb.	.05	.06½
600	lb.	.06	.08
Michigan No. 15	lb.	.06	.06½
Permanente	lb.	.05	.06½
Magnesium Oxide, Light			
Baker's (Neoprene Grade)	lb.	—	.31
General Magnesite (Neoprene Grade)	lb.	—	.30
General Magnesite No. 101	lb.	—	.19½
Genmag ML	lb.	—	.25
K & M (Neoprene Grade)	lb.	.30	.31
Maglite D	lb.	—	.25
M	lb.	—	.31
Marine's (Neoprene Grade) (l.c.l.)	lb.	—	.30
Michigan No. 30	lb.	—	.25
No. 40 Extra Light	lb.	—	.31
Witco Extra Light	lb.	.32	.35
Oleic Acid			
Emersol 210 (dlvd.)	lb.	.12¾	.14½
L.C.P. Red Oil	lb.	.12¾	.14½
Neo-Fat 90-14	lb.	—	.14
92-04	lb.	—	.13½
Palm Oil Fatty Acid (c.l.)	lb.	.10½	.14
Potassium Oleate (dms.)	lb.	.45	.55
Red Lead			
Eagle-Picher	lb.	—	.17
No. 2 RM (dlvd.)	lb.	—	.17
Sodium Laurate, 75%	lb.	.64	.74
Sodium Oleate, 75%	lb.	.45	.55
Paste (dms.)	lb.	—	.20
Sodium Stearate, 75%	lb.	.45	.55
USP Grade (drums)	lb.	—	.37
Stearic Acid, Single Pressed			
Emersol 110 (dlvd.)	lb.	.11¼	.13
Groco 53	lb.	.11¼	.13
Neo-Fat 18-53	lb.	.11¼	.13
Stearex B (dlvd.)	lb.	.15½	.16¾
Stearic Acid, Double Pressed			
Groco 54	lb.	.11¾	.13½
Neo-Fat 18-54	lb.	.11¾	.14½
Stearic Acid, Other			
Neo-Fat 1-58	lb.	.1190	.1315
1-60	lb.	.1400	.1525
1-65	lb.	.1450	.1575
White Lead Basic Carbonate	lb.	.16	.17
White Lead Basic Sulfate	lb.	.14¾	.15¾
Zinc Laurate			
Laurex	lb.	.30	.31
Zinc Stearate	lb.	.39	.41
Aquazinc	lb.	.20	.35

Unclassified Activators

Actifat (dms.)	lb.	—	.18
Actogen	lb.	—	.62
Aktone	lb.	.22	.23
Barak	lb.	—	.62
Curade	lb.	.57	.59
D-B-A	lb.	—	1.95
Dibutylamine (dlvd.)	lb.	.55	.56
MODX	lb.	.295	.345
Polyac	lb.	—	1.65
Ridacto (drums)	lb.	.25	.26
Snodette (dlvd.)	lb.	.16	.17¾
Vulklor	lb.	.75	.85

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	lb.	.17	.21
Aqua Ammonia (dms.)	lb.	.031	.035
M.B.M. (l.c.l.)	lb.	—	.35

ANTI-FOAMING AGENTS

Aero Anti Foam H	lb.	—	.20
Regular	lb.	—	.12
D.C. Antifoam A	lb.	5.45	6.65
Antifoam A Emulsion	lb.	2.05	4.00
Antifoam AF Emulsion	lb.	2.05	2.85
Defoamer A-25	lb.	—	3.00
Deltyl Prime	lb.	.70	.80
Defoamer 630	lb.	—	.12½
Emcol IM	lb.	—	.60
Kessco X-3 (dms.)	lb.	—	.44
RS-968	lb.	.38	.38½
SS-24	lb.	5.80	6.90
66	lb.	5.70	6.20
Terpinol Prime No. 1	lb.	.35	.50

ANTIOXIDANTS

Agebest 1293-22A	lb.	1.90	2.00
Agerite Alba	lb.	2.35	2.45
Gel	lb.	.64	.66
Hipar	lb.	.98	1.00
H. P.	lb.	.72	.74
Powder	lb.	.52	.54
Resin	lb.	.75	.77
Resin D	lb.	.52	.54
Stalite	lb.	.52	.54
White	lb.	1.45	1.55
Akroflex C	lb.	.77	.79
CD	lb.	.72	.74
Aminox	lb.	.52	.54
Antioxidant 2246	lb.	1.65	1.68
Antox	lb.	.52	.54
Aranox	lb.	—	3.25
Benzoquinone	lb.	1.50	1.75
Betanox Special	lb.	.80	.82
B-L-E	lb.	.52	.54
B-X-A	lb.	.52	.54
Carvacrol	lb.	.80	.95
Deenax	lb.	.95	1.05
Di-tert-Butyl-para-Cresol	lb.	.91	.95
Eugenol C-95%	lb.	2.30	2.50
Flectol H	lb.	.52	.59
Flexamine	lb.	.72	.74
Neozone A	lb.	.56	.58
C	lb.	—	.69½
D	lb.	.52	.54

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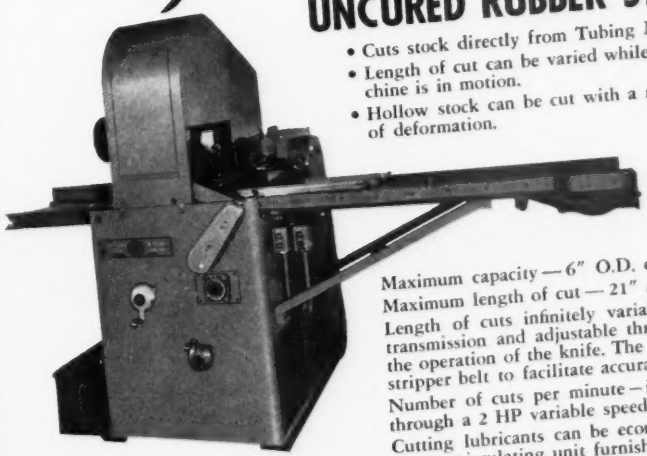

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Maximum capacity — 6" O.D. or 12" wide thin flat stock.
Maximum length of cut — 21" at lower speeds.
Length of cuts infinitely variable through a positive variable transmission and adjustable throw eccentric, synchronized with the operation of the knife. The machine is equipped with driven stripper belt to facilitate accurate feeding of the stock.
Number of cuts per minute — infinitely variable from 15 to 120 through a 2 HP variable speed main drive.
Cutting lubricants can be economically applied through a separate recirculating unit furnished in addition if desired.

Anti-friction bearings throughout, and drives units are completely enclosed and run in oil for efficient lubrication.

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Pacific Rep. Lombard Smith, Los Angeles, Cal.

NEW YORK & EXPORT OFFICE 261 Broadway

ANTIOXIDANTS (Cont'd)

Octamine	lb.	.52	.54
Oxidex	lb.	—	3.60
PDA-10	lb.	.39	.41
Permalux	lb.	—	2.17
Polygard	lb.	.52	.54
Santoflex AW	lb.	.78	.85
B	lb.	.52	.59
BX	lb.	.63	.70
35	lb.	.72	.79
Santovar-A	lb.	1.50	1.57
O	lb.	1.30	1.37
Santowhite Crystals	lb.	1.60	1.67
Santowhite L	lb.	.52	.59
MK	lb.	1.29	1.36
Sequestrene AA	lb.	—	1.00
NA2	lb.	—	.82
NA3	lb.	—	.80
Stabilite	lb.	.55	.57
Alba	lb.	.72	.77
L	lb.	.60	.62
White	lb.	.53	.55
White Powder	lb.	.41	.43
Stabilizer No. 1	lb.	1.55	1.80
Stabilizer No. 9-A	lb.	.80	1.05
Styphen I	lb.	.49½	.54½
Sunolite	lb.	.21	.23
Tannic Acid, Tech.	lb.	.46	.48
Thermoflex A	lb.	.98	1.00
V-G-B	lb.	.70	.72
Wing-Stay S	lb.	.51	.52

ANTI-SCORCHING AGENTS

Armeen HT	lb.	.34	.42
Benzoic Acid—Tech.	lb.	—	.43
Good-rite Vultrol	lb.	.62	.64
Harcopol 1183	lb.	.70	.74
Sodium Acetate 60-62% Crystals	lb.	.08	.08½

ANTISEPTICS AND GERMICIDES

Arquad S	lb.	.22	.25
Formaldehyde (dms.)	lb.	.066	.071
G-4 (bbls.)	lb.	1.04	1.19
G-11	lb.	2.20	2.30
Nuodex 100 S.S. (dlvd.)	lb.	—	1.10
Nuodex 100 W.D. (dlvd.)	lb.	—	1.25
Nuodex Zinc 8% (dms.) (dlvd.)	lb.	.24	.28
Ortho Cresol (26°-27°)	lb.	—	.201
Preventol GD	lb.	—	1.04
I	lb.	—	.80
Retarder D	lb.	.42	.50
Soligen Drier—Copper 8% (dms.)	lb.	.20¾	.21½
Zinc 8% (dms.)	lb.	.22¼	.23½
Vancide	lb.	—	.80

ANTI-WEBBING AGENTS (for Latex)

DC 7 Compound	lb.	5.13	6.50
Webnix 34	lb.	1.50	2.25

AROMATICS (DEODORANTS)

Airkem 115	gal.	—	6.50
122	gal.	—	6.50
186	gal.	—	6.50
Alamask AA	lb.	—	3.00
AD	lb.	—	2.00
AF	lb.	—	2.50
AO	lb.	—	1.50
AR	lb.	—	.50
BG	lb.	—	1.15
BGM	lb.	—	.60
BW	lb.	—	1.85
BWM	lb.	—	2.00
CY	lb.	—	2.40
DL	lb.	—	1.95
H	lb.	—	5.50
LD	lb.	—	.75
LF	lb.	—	4.90
ND	lb.	—	2.75
O	lb.	—	6.50
OS	lb.	—	5.25
Bouquet 149	lb.	—	3.00
Coumarin	lb.	2.95	3.00
Coveral AS	lb.	—	1.20
Curodex 19	lb.	4.75	4.90
188	lb.	5.75	5.90
198	lb.	6.75	6.90
Deodorant 65	lb.	—	1.85
Deoderant L-37	lb.	2.00	2.40
L-44	lb.	2.50	2.90
N.L.T.X.	lb.	1.85	2.15
Deodorant Oil GD 3427	lb.	1.70	2.00
GD 6422	lb.	2.00	2.50
GD 6423	lb.	1.60	1.90
GD 6575	lb.	2.40	2.90
GD 31063	lb.	2.25	2.75
Latex Perfume 5	lb.	—	3.25
6	lb.	—	7.50
9	lb.	—	.65
Naugaromes (dms.)	lb.	.60	3.00
Neutroleum Delta	lb.	—	2.60
Gamma	lb.	—	3.60
Parador A	lb.	2.00	2.50
C	lb.	2.75	3.25
E	lb.	.25	.55
GD 5280	lb.	2.00	2.50
GD 5348	lb.	1.90	3.25

AROMATICS (Cont'd)

Perfume Oil Bouquet Vanilla M	lb.	2.40	2.75
Rodo No. 0	lb.	4.00	4.50
No. 10	lb.	5.00	5.50
Rubbarome (dms.)	lb.	.60	3.80
Rubber Perfume 12	lb.	—	2.85
Russian Leather 7	lb.	—	4.35
Vanillin	lb.	3.00	3.05

BLOWING AGENTS

Ammonium Bicarbonate	cwt.	—	8.00
Blowing Agent CP-975	lb.	.32	.35
Celogen	lb.	—	1.95
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	—	2.30
Sponge Paste	lb.	—	.20
Unicel	lb.	—	.90
ND	lb.	—	.79
S	lb.	—	.20
Urea	lb.	.04¼	.04¾

BONDING AGENTS

Braze	gal.	6.00	7.50
Durez 12987	lb.	.48	.53
Kalabond	gal.	6.50	7.75
MDI	lb.	4.00	6.00
50	lb.	2.00	3.00
Penacolite B1A	lb.	—	.95
R-2710	lb.	—	.95
Pliobond 20	gal.	2.91	4.23
30	gal.	3.65	4.97
Rex Compounds	gal.	1.30	2.85
TDI	lb.	4.00	6.00
Thixons	gal.	3.30	9.00
Ty-Ply Q (BN & S)	gal.	6.75	8.00
Tygobond 30	gal.	5.50	7.45

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	9.00	11.00
Glacial 99½% (dms.)	lb.	.12	.13
Calcium Nitrate, Tech. Crystals	lb.	.07	.11½
Hydroxyacetic Acid—70% (dms.)	lb.	—	.084
Zinc Nitrate, Tech.	lb.	—	.22½

COLORING AGENTS

Black

Aquablak B (also M, R)	lb.	.08½	.11¾
Aquablak S	lb.	.11½	.12
Black Shield 4-35 (dms.)	lb.	—	.09
Carbon Black—See *Reinforcing Agents*			
Lampblack No. 10	lb.	.06	.09
Mapico Black Iron Oxide (50 lb. bags)	lb.	.12¾	.13
Pure Black Iron Oxide	cwt.	12.75	13.00

Blue

Blue GD, Dispersed	lb.	—	4.55
Cooke M.B. Blue	lb.	2.45	2.85
Milori Blue	lb.	—	.48
Monastral Fast Blue CPL	lb.	—	1.77
PCD, Dispersed	lb.	—	2.50
Peacoline Blue	lb.	—	3.85
Ramapo Blue	lb.	3.40	3.45
Rubber Blue X-1999	lb.	—	1.70
Syntheline Blue	lb.	—	3.85
Stan-Tone MBS	lb.	1.55	4.55
GPE	lb.	—	2.50
LPC	lb.	—	4.05
PC	lb.	—	2.40
PDS	lb.	—	2.00
Ultramarine	lb.	.14	.30
Vansul Blue M.B.	lb.	.90	2.65

Brown

Brown Iron Oxide	lb.	.13¾	.14
Mapico Brown (50 lb. bags)	lb.	.13¾	.14

Green

Cooke M.B. Green	lb.	1.45	3.20
Filo Green	lb.	—	.32
Green Chromium Oxide, Pure	lb.	—	.39¾
Green Chromium Oxide, Pure Hydrated	lb.	1.00	1.10
Green FD, Dispersed	lb.	—	2.05
Monastral Fast Green GSD Dispersed	lb.	—	3.20
GSL	lb.	—	1.97
Permansa Green CP-594	lb.	—	1.35
Pigment Green B	lb.	—	1.35
GL-652D	lb.	.80	.85
Ramapo Green	lb.	—	4.00
Rubber Green X-1292	lb.	—	1.30
Stan-Tone MBS	lb.	1.75	3.60
GPE	lb.	—	3.00
LPC	lb.	—	4.60
PC	lb.	—	3.00
PDS	lb.	1.90	2.20
Vansul Green M.B.	lb.	1.05	3.05

COLORING AGENTS (Cont'd)

Maroon

Stan-Tone MBS	lb.	—	3.50
LPC	lb.	—	2.90
Vansul Maroon M.B.	lb.	1.05	2.80

Orange

Molybdate Orange	lb.	—	.44
Orange OD, Dispersed	lb.	—	2.75
Rubber Orange X-2065	lb.	—	3.00
Stan-Tone MBS	lb.	1.25	2.75
GPE	lb.	—	1.20
LPC	lb.	.70	3.35
PC	lb.	—	1.05
PDS	lb.	—	1.20
Vansul Orange M.B.	lb.	2.25	2.60

COLORING AGENTS (Cont'd)

Red

Antimony Trisulfide	lb.	.72	.78
R. M. P. Sulfur Free	lb.	—	.78
R. M. P. No. 3	lb.	—	.72
Cadmium Red	lb.	.95	1.25
Cadmolith Red (bbls.)	lb.	1.75	2.00
Cooke M.B. Red	lb.	.95	3.15
Graphic Red (dlvd.)	lb.	—	.79
Indian Red, American, Pure	lb.	.12¾	.13
Doxco (English)	lb.	.11½	.11¾
Kroma Reds	lb.	.16¼	.21¼
Mapico Reds (50 lb. bags)	lb.	.12¾	.13
Oximony Iron Oxide	lb.	—	.09
Red Iron Oxide, Light	lb.	.12¾	.13
Red PBD, Dispersed	lb.	—	1.75
2BD, Dispersed	lb.	—	1.80
2BL	lb.	—	1.47
PBL	lb.	—	1.65
Rubanox Red CP-762 (dlvd.)	lb.	—	1.40
Rubber Red CP-339 (dlvd.)	lb.	—	1.10
Rubber Red X-1148	lb.	—	.79
Solfast Red	lb.	1.50	1.95
Stan-Tone MBS	lb.	1.20	4.00
GPE	lb.	1.65	2.00
LPC	lb.	1.05	2.20
PC	lb.	1.45	2.40
PDS	lb.	1.40	1.55
Sun Burnt Red	lb.	.11½	.11¾
Vansul Red M.B.	lb.	.95	3.40
Watchung Red	lb.	1.65	2.00

White—Lithopone

Albalith	lb.	.0750	.0825
Eagle-Picher	lb.	.0750	.0825
Permolith	lb.	.0750	.0825
Ponolith	lb.	.0750	.0825
Sunolith	lb.	.0750	.0825

White—Titanium Pigments

Ti-Cal	lb.	.08⅜	.09⅛
Ti-Pure	lb.	.22½	.25½
Titanox A—all grades (dlvd.)	lb.	.22½	.23½
RA (dlvd.)	lb.	.24½	.25½
RA-10 (dlvd.)	lb.	.24½	.25½
RA-NC (dlvd.)	lb.	.24½	.25½
RC (dlvd.)	lb.	.08⅝	.09⅛
RC-HT (dlvd.)	lb.	.08¾	.08⅞
Unitane O-220	lb.	.19½	.20½
OR-250	lb.	.21½	.22½
Zopaque	lb.	.22½	.23½
R	lb.	.24½	.25½

White—Zinc Oxide (American Process)

AZO-ZZZ 11 (and 22, 33, 44, 55)	lb.	.1350	.1400
Eagle-Picher AAA	lb.	.1400	.1500
Horse Head Special	lb.	.1350	.1450
XX	lb.	.1350	.1450
Protox 166	lb.	.1350	.1450
167	lb.	.1350	.1450
St. Joe Black Label	lb.	.1350	.1450
Green Label	lb.	.1350	.1450
Red Label	lb.	.1350	.1450

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	—	.13

White—Zinc Oxide (French Process)

Florence Green Seal	lb.	.1525	.1625
Red Seal	lb.	.1475	.1575
White Seal	lb.	.1575	.1675
Kadox 25	lb.	.1575	.1675
Kadox 15, 17 and 72	lb.	.1350	.1450
Protox 168	lb.	.1350	.1450
169	lb.	.1350	.1450
U. S. P.	lb.	.1675	.1775

White—Zinc Sulfide

Cryptone ZS	lb.	.2530	.2630

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COLORING AGENTS (Cont'd)

Yellow

Benzidine Yellow	lb.	2.50	3.50
Cadmolith Yellow (bbls.)	lb.	—	1.20
Chrome Yellow	lb.	—	.31
Cooke M.B. Yellow 405	lb.	—	1.70
Iron Oxide, Pure	lb.	.10½	.10¾
Mapico Yellow (50 lb. bags)	lb.	.10½	.10¾
Rubber Yellow X-1940	lb.	—	2.15
Stan-Tone MBS	lb.	1.30	4.50
GPE	lb.	—	4.50
LPC	lb.	—	2.25
PC	lb.	.85	4.50
PDS	lb.	1.25	1.75
Toluidine Yellow YL-660 D	lb.	1.15	1.20
Oximony Iron Oxide	lb.	—	.06¾
Vansul Yellow M.B.	lb.	1.05	1.85
Yellow GD, Dispersed	lb.	—	2.15
GL	lb.	—	1.80
Zinc Yellow	lb.	—	.25

DISPERSING AGENTS

Anchoid*	lb.	.24	.25
Armeen 18	lb.	.42	.50
Blancol	lb.	—	.15¾
Darvan No. 1 (and No. 2)	lb.	.22	.30
Daxad 11 (21, 23)	lb.	.08	.30
Dispersaid	lb.	1.25	1.35
Emcol K-8300 (dms.)	lb.	.19	.20
Emulphor ON-870	lb.	—	.61
Furala	lb.	.06½	.07½
Halloid	lb.	.04½	.05½
Igepal CO-630	lb.	—	.36
Igepon T-73	lb.	—	.29½
Leonil SA	lb.	—	.55
Lomar PW	lb.	—	.16
Marasperse C	lb.	.06½	.06¾
CB	lb.	.12¾	.13¼
N	lb.	.09½	.10½
Nekal BA-75	lb.	—	.40
BX-76	lb.	—	.64
Rubbex	lb.	.267	.285
Stablex B	lb.	.50	.95
Stan-Chem BQC	lb.	.12¼	.17¼
1067	lb.	—	.13½
1471	lb.	.1687	.2187
2251	lb.	.12¼	.17¼
Trenamine D-25	lb.	.32½	.36
Triethanolamine (drums) (dlvd.)	lb.	.24½	.27¼
Yelkin TT	lb.	.13	.17
Zinsper	lb.	—	.15

EXTENDERS

Advagum 1098	lb.	—	.64
Arcco 1071-13B	lb.	.14½	.15½
1073-18B	lb.	.13½	.14½
1294-36B	lb.	.11½	.12½
Bunaweld Polymer No. 780	lb.	—	.22
No. 5514	lb.	—	.35
D-92 (and D-93) (dms.)	lb.	—	.12
Car-Bel-Ex-A and B	lb.	—	.14
Extender 600	lb.	—	.1480
Nopco 2271	lb.	.15½	.16½
Polyco 418	lb.	.17	.18
PR-162 Latex Extender	gal.	—	1.55
Synprolac	lb.	.16	.23
Synprowax	lb.	—	.23
Vistanex	lb.	—	.45

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite	lb.	.20	1.33
Lomite	lb.	.14½	1.25
Pumice	lb.	.03	.05
Aluminum Hydrate	lb.	.07	.10
Aluminum Silicate			
Marter White	ton	18.50	30.00
Barium Carbonate (l.c.l.)	ton	95.50	100.00
Barytes			
No. 1 Floated, White	ton	41.35	60.10
No. 2 Floated, Unbleached	ton	39.35	58.10
No. 22 Barytes (c.l.)	ton	—	25.00
Foam A	ton	—	41.35
XIOR	ton	75.00	80.00
Bentonite (c.l.)	ton	—	13.50
Argosite Clay (c.l.)	ton	—	12.50
Bennett Clay (c.l.)	ton	—	32.50
SPV Volclay (c.l.)	ton	—	12.50
White Hi-Gel	ton	—	65.90
Blanc Fixe	ton	72.50	120.00
Calcium Carbonate			
Atomite (c.l.)	ton	—	30.00
B.I. White No 1 (c.l.)	ton	—	7.50
B.I. White No. 2 (c.l.)	ton	—	7.00
Blue Star XX	ton	—	15.50
Calcene NC	ton	72.50	92.50
TM	ton	75.00	95.00
Calwhite	ton	—	17.00
Camel-Carb	ton	—	10.00
Camel-Tex	ton	—	18.00
Camel-Wite	ton	—	30.00
Duramite	ton	—	15.00
Gamaco	ton	—	30.00
Kalite	ton	50.00	65.00
Keystone White	ton	—	16.00
Laminar	ton	—	30.00
Lesamite (c.l.)	ton	—	27.50

FILLERS (Cont'd)

Calcium Carbonate (Cont'd)			
Lorite	ton	30.00	35.00
Millical	ton	35.00	50.00
Multifex	ton	140.00	155.00
MM	ton	110.00	125.00
Non-Fer-Al	ton	30.00	45.00
Purecal M	ton	56.75	80.75
SC	ton	110.00	125.00
T	ton	110.00	125.00
U	ton	120.00	135.00
Rambo No. 1	ton	—	8.50
Sierracal	ton	15.00	18.50
Snowflake	ton	17.00	18.00
Super Multifex	ton	160.00	175.00
Surfex	ton	35.00	50.00
Suspenso	ton	33.00	48.00
Witcarb Reg.	ton	56.75	80.75
P	ton	110.00	125.00
R	ton	120.00	135.00
RC	ton	110.00	125.00
York White	ton	—	9.50
Calcium Silicate			
Silene EF	ton	120.00	140.00
Calcium Sulfate, Anhydrous			
Snow White Filler	ton	—	20.50
Calcium Sulfate, Hydrous			
Terra Alba No. 1	ton	12.00	14.40
Chalk Whiting (l.c.l.)	lb.	.0150	.0175
Recco Paris Whiting	ton	—	33.00
Clay			
Aiken Clay	ton	—	14.00
Alsilite (c.l.)	ton	20.00	45.00
Alsite (c.l.)	ton	—	14.00
Aluminum Flake	ton	20.00	60.00
Buca (c.l.)	ton	—	45.00
Burgess No. 20	ton	—	35.00
No. 30	ton	—	37.00
Burgess Iceberg	ton	—	50.00
Catalpo (c.l.)	ton	—	35.00
Champion	ton	—	14.00
C.S.D. (c.l.)	ton	—	13.50
Crown	ton	—	14.00
Dixie (c.l.)	ton	—	14.00
Franklin Clay (c.l.)	ton	—	13.50
Harwick Clays	ton	15.50	50.00
Hi-White R	ton	—	13.50
Kaolloid Clay (c.l.)	ton	—	10.50
McNamee (c.l.)	ton	—	13.50
Paragon	ton	—	13.50
Pigment 5	ton	23.50	26.50
Pigment 10	ton	20.00	22.50
Pigment 33	ton	—	37.00
Recco (c.l.)	ton	—	14.00
Snohrite	ton	—	12.50
Suprex	ton	—	14.00
Whitetex (c.l.)	ton	—	50.00
Windsor Clay (c.l.)	ton	—	14.00
Diatomaceous Earth	ton	30.00	50.00
Kaylorite (c.l.)	ton	—	30.00
Lorite	ton	—	30.00
Flock			
Cotton, white and colored	lb.	.13	.32
Filfloc F 40-9000	lb.	—	.16
Filfloc F 6000	lb.	—	.40
Polycel	ton	110.00	210.00
Rayon, bleached or dyed	lb.	.82	1.25
Rayon, grey	lb.	—	.18
Rayon pink	lb.	—	.18
Solka-Floc (l.c.l.)	lb.	.07	.16
Glue Bone (dlvd.)	lb.	.18	.20½
Leather, Shredded	lb.	.05	.17
Lignin	lb.	.03	.06
Indulin	lb.	.06	.08
Limestone, Pulverized	ton	3.00	4.75
Georgia Marble No. 10.	ton	—	10.00
Industrial Filler No. 100	ton	—	5.75
Micro Velva	ton	49.00	51.00
Velvet Filler, Superfine	ton	—	30.00
Magnesium Carbonate	lb.	.0950	.1050
K & M Clearcarb	lb.	.1225	.1275
Magnesium Oxide	lb.	.05	.06
Magnesium Silicate (see Talc)			
Mica	lb.	.01¼	.07¼
Concord	lb.	.07½	.08¼
Micro-Mica	lb.	.07½	.08¼
Mineralite (c.l.)	ton	30.00	85.00
Silversheen	lb.	.07½	.08¼
Triple A Mica (c.l.)	ton	—	25.00
Vermiculite	lb.	—	.11
Wet Ground Biotite Mica	lb.	.06¼	.07
Wet Ground Mica No. 160	lb.	.07½	.08¼
Pyrophyllite			
No. 261	ton	—	11.50
Pyrax A (c.l.)	ton	—	13.50
WA (c.l.)	ton	—	16.00
Sawdust, Graded	ton	14.00	35.00
Silica	ton	16.00	27.00
Blue Star	ton	—	20.60
Slate, Powdered (l.c.l.)	ton	15.00	20.00
Lo-Micron Slate Flour	lb.	—	.04½
No. 133 Slate Flour	ton	—	4.55
Talc (Magnesium Silicate)			
Asbestol Regular	ton	—	25.00
Blue Star	ton	—	23.00
French	ton	—	59.00
L. S. Silver	ton	29.25	34.25
No. 367	ton	—	13.00
No. 1600	ton	—	70.60
No. 1768	ton	—	13.00
Nytal 200	ton	—	25.00
300	ton	—	36.00
Sierra White	ton	25.75	30.75
Soapstone	ton	—	13.00

FILLERS (Cont'd)

Walnut Shell Flour	ton	45.00	115.00
Stan-Shell	ton	63.00	126.00
Whiting, Commercial	ton	—	7.00
Camel-Carb	ton	—	10.00
C-C-O White	ton	—	19.00
Georgia Marble No. 15	ton	—	15.00
No. 16	ton	—	16.00
Keystone (c.l.)	ton	—	16.00
Snowflake (c.l.)	ton	17.00	18.00
Stan-White 325	ton	8.50	11.10
Veroc (c.l.)	ton	—	8.50
Welco (c.l.)	ton	—	8.50
York White R (c.l.)	ton	—	8.50
Wood Flour	ton	24.00	48.00

FINISHING MATERIALS, SURFACE

Beaco Finishes	gal.	2.10	2.35
Black Out	gal.	4.50	8.00
Shellac, Orange Gum	lb.	.35	.45
VanWax	gal.	1.45	1.50

FLAME RETARDANTS

Chlorowax 70	lb.	.18	.19
Halowax	lb.	.35½	.61½
Zinc Borate 3167	lb.	.1920	.2020
Zyrox	lb.	.76½	.86½

LUBRICANTS, MOLD

Akro Gel	lb.	—	.165
Alipal CO-433	lb.	—	.21
CO-436	lb.	—	.30
Aquadag	lb.	3.50	4.00
Aquarex D	lb.	—	.78
E	lb.	—	.94
ME	lb.	—	.94
MDL	lb.	—	.33
WAQ	lb.	—	.25
Armid O	lb.	.46	.82
Borax, Granular (l.c.l.)	ton	89.00	94.00
Carbowax 4000	lb.	.31	.32
CD Mold Release A	gal.	—	7.00
B	gal.	—	5.00
Colite Concentrate (dms.)	gal.	—	.90
Concentrex	lb.	—	.25
Dag Dispersions No. 197	lb.	1.85	2.65
D.C. 7 Compound	lb.	5.13	6.50
D.C. Emulsion No. 7	lb.	1.59	2.07
No. 8	lb.	1.46	1.98
No. 35	lb.	1.46	3.50
No. 35A	lb.	1.46	3.50
No. 35B	lb.	1.46	3.50
D.C. Mold Release Fluid	lb.	3.70	6.00
Dipex	lb.	.14	.18
Dri-Lube	lb.	—	.22
Glydag G	lb.	1.30	2.00
Hawkeye Flake (dlvd.)	lb.	.08¼	.10¼
Igepal CO-430	lb.	—	.39
CO-530	lb.	—	.39
CO-630	lb.	—	.36
Igepon AP-78	lb.	—	.49
T-51	lb.	—	.13½
Kokobace R	lb.	.17½	.18½
Lubrex	lb.	.25	.30
Lubri-Flo	gal.	10.00	12.00
Migralube	lb.	—	.35
Mold Lubricant No. 72 Conc.	gal.	2.50	4.00
No. 735	gal.	1.26	2.75
No. 769	gal.	1.20	2.60
No. 880	gal.	1.12	2.50
No. 856	gal.	2.00	4.00
No. 935	gal.	1.75	3.25
No. 980	gal.	1.65	3.15
Moldeze No. 3	gal.	5.00	6.00
Mold-Brite	gal.	—	1.50
Mold-Slick	lb.	.253	.271
Mold-White	gal.	—	2.00
Monopole Oil MD	lb.	—	.18
Olate Flakes	lb.	—	.16¾
Orvus WA Paste (dms.)	lb.	—	.25
Polyglycol 15-200	lb.	.26½	.33
E4000	lb.	.33	.39
Prodag	lb.	.28	.42
Purity Flake (dlvd.)	lb.	.11	.14
Rubber-Flo	gal.	1.25	1.60
Rubber-Glo	gal.	—	.94
Rusco Mold Paste	lb.	—	.25
Sericite (l.c.l.)	ton	65.00	75.00
SF-92	lb.	3.70	4.22
SM-33	lb.	1.50	1.68
55	lb.	1.46	2.00
61	lb.	1.46	1.68
Thermalube	lb.	—	.13¾
Ucon Lubricants	lb.	.26¼	.27¾
Ulco Mold Soap	lb.	.12	.23

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	—	.25
Emcol DS-50	lb.	—	.38
RDH-S	lb.	—	.27
Extrud-o-Lube	gal.	—	1.54
G.B. Naphthenic Neutrals	gal.	.11	.18
Ivory Chips	lb.	.14½	.15½
Latex-Lube GR (dlvd.)	lb.	.19¼	.20
Propylene Stearate (dms.)	lb.	.68	.78

CABOT PINE PRODUCTS

PINE TAR
LIGHT
MEDIUM
HEAVY
PINE TAR OIL
PINE OIL
DIPENTENE

Quality Control
Dependable Supply
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good workmanship

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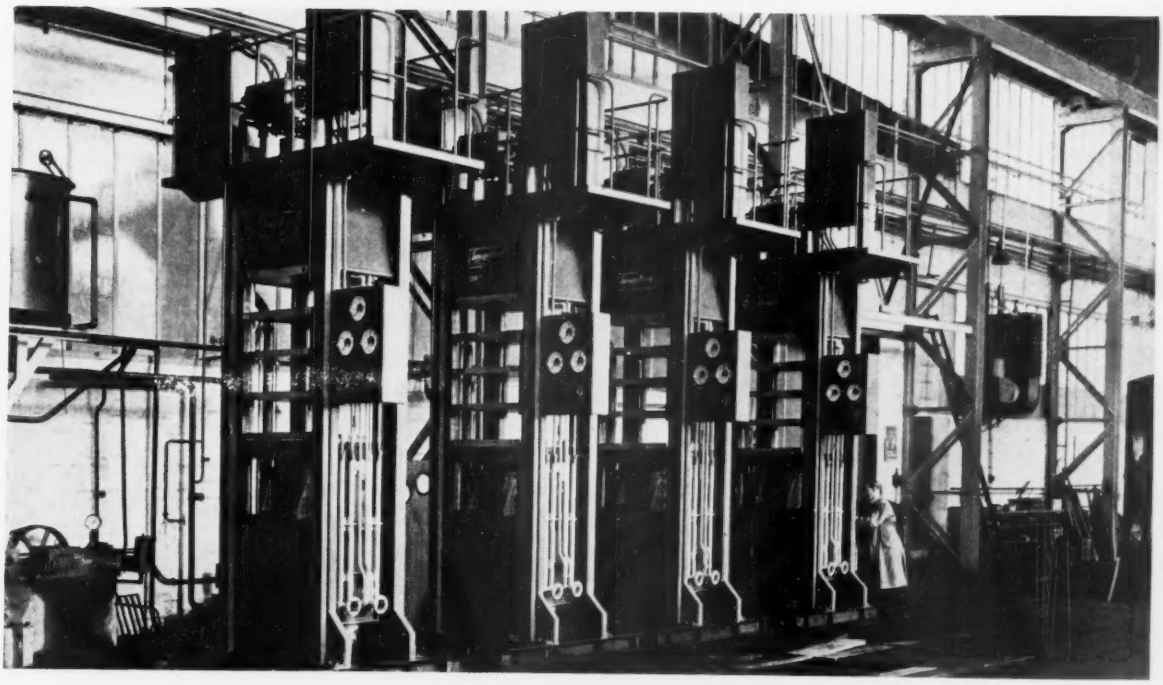
AKRON 9, OHIO



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LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.37	.42
Calcium Stearate	lb.	.35	.40
D.C. 4 Compound	lb.	5.13	6.50
D.C. 200 Fluid	lb.	3.70	6.00
Glycerized Lubricant	gal.	—	1.48
Glydag G	lb.	1.50	2.10
Hydro-Zinc	lb.	—	.20
Latex-Lube Pigmented (dlvd.)	lb.	.17¾	.18¾
R-66 (dlvd.)	lb.	—	.16½
Liqui-Lube (dlvd.)	lb.	—	.16¼
N.F. (dlvd.)	lb.	—	.16¾
N.T. (dlvd.)	lb.	—	.16¾
Polyethylene Glycol	lb.	.26½	.29
Rexanol	lb.	—	.11
Separex	**lb.**	—	**.25**
Stock-Lube	lb.	—	.19
Slab-Dip	lb.	—	.15
Wet-Zinc	lb.	—	.22¼
Zinc Stearate	lb.	.39	.41
Z.S.D. Dispersion	lb.	—	.20

MOLD CLEANERS

Actusol (dlvd.)	gal.	1.45	1.65
Alkon (dlvd.)	lb.	.16	.16½
Metso Anhydrous	cwt.	4.85	7.10
Metso 99	cwt.	4.50	6.75
Metso 200	cwt.	6.00	6.75
Metso Granular	cwt.	4.00	6.25
Orvus Extra Granules	lb.	.20½	.21½
Rubber-Sol	gal.	2.97	3.97
Shelblast	ton	80.00	165.00
Sprex A.C. (dlvd.)	lb.	.17¾	.18¾

PEPTIZING AGENTS

Peptizer P-12	lb.	.95	1.25
Pepton 22 Plasticizer	lb.	.79	.82
RPA 2	lb.	—	.78
3	lb.	—	.47
3 Conc.	lb.	—	.97
5	lb.	—	.59
6	lb.	—	1.58

PLASTICIZERS & SOFTENERS

AA (dms.)	lb.	—	.22½
Acto 500	**lb.**	—	**.09**
Adipol BCA (dms.)	lb.	.46¾	.47¼
2EH	lb.	.46¾	.47¾
10A	lb.	.46¾	.47¾
ODY	lb.	.53¾	.54¾
American Pine Tar	lb.	.0410	.0678
Arneel	lb.	.22	.27
Arolene 1680 (c.l.)	lb.	—	.10
Aromatic Plasticizer 10 (and 25)	lb.	—	.05
Aromatic Tar	gal.	.0573	.1973
Bardol	lb.	.02¾	.03¾
B	lb.	.06¼	.06½
Bayol D	gal.	—	.382
F	gal.	—	.52
Beeswax, Bleached	lb.	.70	.75
Yellow Refined	lb.	.57	.62
Bondogen	**lb.**	**.55**	**.60**
B.R.C. No. 20	lb.	.0150	.0175
B.R.H. 2	lb.	.0213	.0351
BRS 700	lb.	.02	.0285
B.R.T. 3	lb.	.0180	.0265
4	lb.	.0250	.0260
7	lb.	.03	.031
B.R.V.	lb.	.0475	.0565
Bunarex Resins	lb.	.06½	.07½
Bunatak AH	**lb.**	**.08**	**.09**
U	lb.	—	.17½
No 90	lb.	—	.09
No. 210	lb.	—	.14
Burgundy Pitch	**lb.**	**.0843**	**.0888**
Butac	lb.	.11¾	.12¾
Butoxyethyl Diglycol Carbonate	lb.	.40	.41
Butyl Benzyl Sebacate	lb.	.87	.89¾
Butyl Carbitol Perlargonate (dms.)	lb.	—	.64½
Butyl Cellosolve Perlargonate (dms.)	lb.	—	.68
Butyl Palmitate	lb.	—	.26½
Butyl Roleate	**lb.**	.176	.18
Butyl Stearate (dms.)	lb.	.24½	.26
BWH-1	lb.	.16	.17
Cabflex DDA (dms.)	lb.	.50¼	.51¾
DDP (dms.)	lb.	.39¾	.40¾
Di-BA (dms.)	lb.	.45¼	.46¼
Di-OA (dms.)	lb.	.46¾	.47¾
Di-OP (dms.)	lb.	.36¾	.37¾
Di-OZ (dms.)	lb.	.53¾	.54¾
Cabol 100	lb.	.04	.07
Califlux 510, 550	lb.	.02½	.03¼
G.P.	**lb.**	**.0125**	**.02**
R-100	lb.	.04½	.05¼
TT	lb.	.0170	.0245
Candelilla Wax Prime	lb.	.74	.77
Capryl Benzyl Sebacate	lb.	.89	.91¾
Carbowax 4000 (dms.)	lb.	.31	.32
Cardolite 615	**lb.**	**.33¼**	**.36¼**
816	**lb.**	**.25¾**	**.28¾**
Carnauba Wax, Crude	lb.	1.00	1.10
Refined	lb.	1.05	1.10
Yellow	lb.	1.30	1.35
Castorwax	lb.	.3260	.3380
Celluflex (dms.)	lb.	.34¾	.35¾
Ceresine Wax	lb.	.14	.26
Chlorowax 40	lb.	.14½	.15½
CTLA Polymer	gal.	.20	.36
Cumar Resins	lb.	.06½	.17
Darex DBP	lb.	.34	.36¾
DOP	lb.	.35	.37¾
DIOP	lb.	.35	.37¾
D.B.M.	**lb.**	—	**.30**
Degras, Common	lb.	—	.16

PLASTICIZERS & SOFTENERS (Cont'd)

Diallyl Phthalate (dms.)	lb.	.51½	.52¼
Dibenzyl Sebacate	lb.	.88	.90¾
Dibutoxethyl Sebacate	lb.	—	.5634
Dibutyl Phthalate	lb.	.34	.36¾
Dibutyl Sebacate	lb.	.80	.82½
Dicapryl Adipate	lb.	.41	.43¾
Dicapryl Phthalate	lb.	.34¾	.35¾
Dicapryl Sebacate	lb.	.66½	.69¼
Di-Carbitol Phthalate (dms.)	**lb.**	**.42**	**.42½**
Dicyclohexyl Phthalate	lb.	.59	.59
Diethyl Phthalate (t.c.)	lb.	.25	.27¾
Di-2-ethylhexyl Phthalate (t.c.)	lb.	—	.35
Dihexyl Adipate	lb.	.39	.41¾
Dihexyl Phthalate	lb.	.35	.37¾
Dihexyl Sebacate	lb.	.72	.74¾
Diisobutyl Azelate	lb.	—	.47¾
Di-iso-octyl Adipate (dms.)	lb.	—	.47¾
Di-iso-octyl Phthalate (t.c.)	lb.	—	.35
Dimethyl Phthalate (.c.)	lb.	.27½	.30¼
Dimethyl Sebacate	lb.	1.25	1.27¾
Dinopol	lb.	.37¾	.38¾
Dioctyl Phthalate (dms.)	lb.	.35	.37¾
Dioctyl Sebacate (dms.)	lb.	.71	.73½
D.I.O.P. (dms.)	lb.	.36¾	.37¾
Dipolymer Oil	gal.	—	.33
Dispersing Oil No. 10	lb.	.06	.06¼
Dutrex B	**lb.**	**.02¾**	**.03¼**
5 and 6	lb.	.020	.031
15E	gal.	.10	.20
20, 21, 22 and 25	**lb.**	—	**.04**
Elastex 10-P	lb.	.35	.37½
50-B	lb.	.31	.33¾
DCHP	lb.	.60	.61
Emulphor EL-719	lb.	—	.62
Estac	lb.	—	.16
Ethox (dms.)	lb.	.45¼	.45¾
Flexol B-400	**lb.**	**.28**	**.30**
DOP	lb.	.36¾	.37¾
TOF	lb.	.46	.48¾
3GH	lb.	.44	.46
3GO	lb.	.53	.55
4GO	lb.	.35¾	.36¼
8HP	lb.	.36	.38¾
Flexricin P-1	lb.	.34¼	.36
P-4	lb.	.33¼	.35
P-4C	lb.	.43¾	.45½
P-6	lb.	.38¼	.40
P-8	lb.	.33¼	.35
Fortex (dms.)	lb.	.12½	.14½
Galex W-100	lb.	.15½	.19¼
G. B. Light Process Oil	**lb.**	**.025**	**.0325**
Medium Process Oil	lb.	.03½	.04¼
G. B. Naphthenic Neutrals	**gal.**	**.11**	**.18**
Good-Rite GP233	lb.	.45	.47¾
GP261	lb.	.35	.37¾
Harflex 500 (dms.)	lb.	.32	.34¾
Herron-H.T.	**gal.**	**.16**	**.27**
Herron-Plas	**lb.**	—	**.03¾**
Herron-Wax	**lb.**	**.05¼**	**.06**
No. 23	**lb.**	**.08¼**	**.08¾**
No. 24	**lb.**	**.07¼**	**.07¾**
HSC No. 13	**lb.**	**.27**	**.30**
Hylene B	**lb.**	**.45**	**.50**
C	**lb.**	**.41**	**.46**
D	**lb.**	**.47½**	**.52½**
Indenex 632½ (633½, 634½, 637½)	**gal.**	**.11**	**.17**
Kapsol	**lb.**	**.34**	**.35**
Kenflex	lb.	.18	.27
Kesscoflex 10! (dms.)	**lb.**	—	**.39**
102 (dms.)	**lb.**	—	**.32½**
103 (dms.)	**lb.**	—	**.41½**
104 (dms.)	**lb.**	—	**.48**
105 (dms.)	**lb.**	—	**.33¼**
105 (dms.)	**lb.**	—	**.35½**
KP 23 (dms.)	**lb.**	**.31**	**.32**
70 (dms.)	lb.	.37¾	.38¼
90 (dms.)	lb.	.46¾	.47¾
120 (dms.)	lb.	.52	.52½
140 (dms.)	lb.	.47¾	.48¼
201 (dms.)	lb.	.58	.59
220 (dms.)	lb.	.32¾	.33¼
555 (dms.)	lb.	.33	.33½
Kremol 40	gal.	.36	.46
50	gal.	.39	.49
Kronisol (dms.)	lb.	.35¾	.36¼
Kronitex AA (dms.)	lb.	.34¾	.35¾
I (dms.)	lb.	.34¾	.35¾
Lanolin, Tech. Anhydrous	lb.	—	.31
Lead Oleate	lb.	—	.30½
Lindol (dms.)	lb.	.34¾	.35¾
2-Mercaptoethanol (drums)	lb.	1.25	1.50
Methox (dms.)	**lb.**	**.41¼**	**.41¾**
Methyl Laurate	lb.	.25	.27
Methyl Oleate	**lb.**	—	**.20**
Methyl Stearate (dms.)	**lb.**	—	**.30**
Montan Wax, Crude	lb.	.13	.14
Monten Wax	lb.	—	.30½
Morflex	lb.	.35	.51¾
MR 2088 (dms.)	lb.	—	.19
Natac	lb.	.11¼	.12¾
Nebony Resins (dms.)	lb.	.04	.04½
Neolene 210 (t.c.)	**lb.**	—	**.16**
212 (t.c.)	**lb.**	—	**.14**
220 (t.c.)	**lb.**	—	**.15**
Nerium	**lb.**	—	**.09**
Nevillac Resins (dms.)	lb.	.31	.85
Neville Resins (dms.)	lb.	.12	.18
Nevindene Resins (dms.)	**lb.**	.15	.18
Nevinol (dms.)	lb.	—	.20
Nuba 1 (and 2) (dms.)	lb.	.05¾	.06¾
3X (dms.)	lb.	.07¾	.08¼
15 (and 30) Oil (dms.)	lb.	.36¼	.38
No. 480 Oil Proof Resin	lb.	—	.18

PLASTICIZERS & SOFTENERS (Cont'd)

Ohopex Q10 (dms.)	lb.	.35¾	.36¾
R9 (dms.)	lb.	.37	.37½
Opalwax	**lb.**	**.37**	**.38**
Ortho-Nitrobiphenyl	lb.	.13	.15
Ozokerite Wax No. 64			
White	lb.	.26	.27
Yellow	lb.	.24	.25
Palm Oil	**lb.**	—	**.11**
Paradene Resins (dms.)	lb.	.06½	.07½
Para Flux (dms.)	gal.	.1925	.2025
2016 (dms.)	gal.	.22	.23
Para Lube (l.c.l.)	lb.	.046	.048
Parmo	lb.	.06	.13½
Pepton 22 Plasticizer	lb.	.79	.82
PG-16	lb.	.38¼	.40
Picco 10 (and 25)	lb.	—	.13¼
75 (and 100)	lb.	—	.13
Piccocizer 30	lb.	—	.05¼
Piccolastic A (and B, C, D, E)	lb.	.28	.29
F1, FHF and FX	lb.	—	.1815
T-135	lb.	.22¾	.23¼
Piccolyte S Resins	lb.	.18½	.20
Piccopale Resins	lb.	.12	.13½
Piccoumaron Resins	lb.	.06½	.17
Pigmentar	lb.	.0389	.0678
Pigmentaroil	lb.	.0394	.0678
Plastac M	**lb.**	—	**.09¼**
Plasticizer 2286	**lb.**	—	**.26¼**
Plasticizer ODN	lb.	.31	.37
Plasticizer SC	**lb.**	**.49**	**.52**
Plasticizer W-13	**lb.**	**.37**	**.38¼**
Plasticizer XP-3	**lb.**	—	**.50**
Plastoflex 50	lb.	.34¼	.35¼
55	lb.	.31¾	.32¾
520	lb.	.37½	.38½
VS	lb.	.38¼	.39¼
Plastogen	**lb.**	**.07¾**	**.08**
Plastolein 9050 (c.l.)	lb.	.56	.59
9055	lb.	.35	.38
9058	lb.	.52	.55
9250	lb.	.27	.30
9715	lb.	.35	.38
Plastone	**lb.**	**.27**	**.30**
Polycin 783	lb.	.29½	.30½
Polycizer 162	lb.	.37	.39¾
332	lb.	.43	.45¾
ED	lb.	—	.56¾
Polyco 438	lb.	.32	.34
Polymel C-130	lb.	.19½	.20½
D	lb.	.23½	.24½
6	lb.	.05¾	.07¾
Process Oil C-255 (c.l.)	**gal.**	—	**.22**
Propylene Stearate (dms.)	**lb.**	—	**.32**
PT 67 Light Pine Oil (dms.)	gal.	—	.60
101 Pine Tar Oil (t.c., dms)	gal.	33½	.44½
400 Pine Tar (600, 800) (t.c., dms.)	gal.	.35	.46
PX-104	**lb.**	**.34**	**.42**
PX-108	**lb.**	**.38**	**.46**
PX-208	**lb.**	**.41½**	**.49**
PX-404	**lb.**	**.60**	**.68**
Reogen	lb.	.13¼	.13½
465 Resin (dms.)	**lb.**	**.07**	**.07½**
Resin 731-C	**cwt.**	—	**15.00**
Resin C	lb.	.0225	.0310
Resinex	lb.	.03¼	.03¾
L-4	lb.	.02¼	.03
Rexflex	lb.	—	.15
Rosin Oil	gal.	.54	1.20
R.S.O. Softening Oil	lb.	.03	.05
Rubberol	lb.	—	.25¾
Rubtar	gal.	—	.40
Santicizer B-16	lb.	.52	.54¾
E-15	lb.	.51	.53¾
M-17	lb.	.48	.50¾
No. 107	lb.	.38¾	.39¾
No. 140	lb.	.33	.35¾
No. 141	lb.	.37	.39¾
No. 160	lb.	.31	.33¾
Sherolatum	lb.	.03½	.06
Softener No. 20	**gal.**	**.09**	**.25**
Staflex DBES	lb.	.72½	.73½
DOS	lb.	.72½	.73½
LXA	lb.	.36	.37
KA	lb.	.38¾	.39¾
Stanolind Petrolatum	lb.	.053	.089
Wax	lb.	.31	.33
Staybelite Resin (dms.)	cwt.	—	12.00
Sunny South Burgundy Pitch	lb.	.0980	.1025
Sunny South Pine Tar	lb.	.0389	.0678
Sunny South Rosin Oil	gal.	.58	.87½
Superla Wax	lb.	.34½	.44
Syncera Wax	lb.	.23	.34
Syn Tac (c.l.)	**gal.**	—	**.33**
Synthetic Revertant Oil	lb.	—	.16
Tar, Refined	**gal.**	**.12**	**.17**
K-Tarnel NR (t.c.)	**lb.**	—	**.0851**
Terpene A	**gal.**	—	**.65**
TP-90B	lb.	—	.59
TP-95	lb.	—	.65
Transphalt Resins	lb.	.02¼	.03¾
Triacetin	**lb.**	**.34**	**.45**
Tributyl Phosphate (dms.)	lb.	.51¾	.52¾
Tricresyl Phosphate (t.c.)	lb.	.33	.34
Turgum S	lb.	.10	.11
Vanadiset A	**gal.**	**.13**	**.20**
Vistac No. 1	gal.	1.00	1.21
P	lb.	.18	.18¼
Vopcolene 50	lb.	—	.37
Witresin—Granular	**ton**	**41.00**	**43.00**
Solid	**ton**	**36.00**	**38.00**

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We can save you 25 to 50% on the cost of mold lubricant and still maintain a fine finish.

RUBBER-FLO is odorless, nontoxic and it keeps molds clean.

We suggest you tell us your problem, and we will be glad to send samples and recommended formulation.

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Latex Thickeners

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POLYCOS 296BT and 296N

. . . are sodium polyacrylate thickeners available as high (296BT) and medium (296N) viscosity grades. They are water soluble anionic colloids furnished as straw-colored, homogeneous solutions containing 15% solids.

POLYCOS 296BT and 296N

. . . are recommended as stabilizers, protective colloids and thickeners for natural, synthetic, rubber and resin latices. They are particularly noted for their exceptionally high thickening action on most types of natural and synthetic latices. Their unique adhesive, suspending, emulsifying and film-forming characteristics, make them adaptable to many industrial uses.

Alone, Polycos 296BT and 296N produce clear, slightly yellow, films. These acrylic thickeners are fully saturated compounds and deposited films will not oxidize or embrittle with age; they will not alter color values of pigments or dyes.

For complete information and data, write for Bulletin P-27.

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POLYMER CORPORATION

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PROCESSING AIDS

Calcium Riconoleate	lb.	——	.56
Castor Oil, Processed (dms.)	lb.	.27	.28½
Refined (dms.)	lb.	.3260	.3330
Dutrex 7	lb.	.12	.20
ELA	lb.	——	.82
Emcol MAS	lb.	——	.44
Kenflex N	lb.	——	.18
Millrex	lb.	——	.15
Resin No. 510	lb.	.13½	.16½
Zyrox	lb.	.50	.79

PROTECTIVE & STABILIZING AGENTS

Acacia	lb.	.12¾	.21
Alpha Protein	lb.	.24	.28
Ammonium Alginate	lb.	——	.95
Aroostoocrat	lb.	——	.07½
Carob Bean Flour	lb.	——	.46
Casein	lb.	.28	.38
Emcol K-8300 (dms.)	lb.	.19	.20
Ethylene Diamine 68%	lb.	.44	.47
Gum Arabic	lb.	——	.19
Karaya Gum	lb.	——	.25
Locust Bean Gum	lb.	——	.31
Prosein	lb.	.0600	.0630
Rex Compound No. 2801	lb.	——	.15
Stablex B	lb.	.50	.95
K	lb.	.27	.35

RECLAIMING AGENTS

Amalgamator Z-4	——	——	.32
Armeen C	lb.	.45	.49
Mixed Crude	lb.	.17	.23
T	lb.	.30	.34
No. 517 H.B. Oil	gal.	.11½	.16½
535	gal.	.22	.27
Burco RA	lb.	.05½	.08¼
C-6 Oil (and 28, 32)	gal.	.33	.38
C-10 Oil	gal.	.25	.30
C-33	gal.	——	.21½
C-42	gal.	——	.23
Caustic Soda—Flake 76% (c.l., dms.)	cwt.	——	4.10
Liquid 50% (t.c.)	cwt.	——	2.55
Solid 76% (c.l., dms.)	cwt.	——	3.70
Cresylic Acid (99-100%)	gal.	.90	1.23
D-4	gal.	——	.27
E-5	gal.	——	.25
Flake Calcium Chloride (77-80%)	ton	——	27.00
G. B. Reclaiming Oil	gal.	.12	.18
CD-10	gal.	.10	.16
CD-50-U	gal.	.18	.24
Gensol No. 6 (t.c.)	gal.	——	.45
Heavy Aromatic Naphtha	gal.	——	.12¾
LX-77 Reclaiming Solvent	gal.	.21	.33
LX-572 Reclaiming Oil	gal.	.27	.32
LX-777 Reclaiming Oil	gal.	.23	.33
Neo-Fat D-242	lb.	.05½	.07¼
PRR 1	gal.	.15	.35
PT 67 Light Pine Oil (dms.)	gal.	——	.60
PT101 Pine Tar Oil (t.c., dms.)	gal.	.33½	.44½
Q Oil	gal.	——	.286
Reclaiming Oil 3186 (t.c.)	gal.	.28	.38½
Reclaiming Oil 3186-G	gal.	.25	.36½
Reclaiming Reagent No. 1431	lb.	.21	.25
R.P.A. No. 3	lb.	——	.47
RR-10	lb.	——	.36
Soda Ash (c.l., bags)	cwt.	——	1.65
Solvent 534	gal.	.20½	.26½
Solvent Oil 21	gal.	.24	.29
C-42	gal.	.23	.28
Union Solvent 4060-O	gal.	——	.184
X-1 Resinous Oil	lb.	.0210	.0275

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98	lb.	.0740	.1225
Continental F	lb.	.0740	.1225
Croflex	lb.	.0740	.1225
Dixiedensed (and S)	lb.	.0740	.1225
HX Compact	lb.	.0740	.1225
Kosmobile (and S)	lb.	.0740	.1225
Micronex HPC	lb.	.0740	.1225
Spheron 4	lb.	.0740	.1225
Witco Disperso No. 6	lb.	.0740	.1225

Channel, Medium Processing (MPC) (bags)

Atlantic MPC-95	lb.	.0740	.1225
Continental A	lb.	.0740	.1225
Croflex TH	lb.	.0740	.1225
Dixiedensed HM (and S-66)	lb.	.0740	.1225
Huber Arrow TX	lb.	.0740	.1225
Kosmobile HM (and S-66)	lb.	.0740	.1225
Micronex Standard	lb.	.0740	.1225
Spheron 6	lb.	.0740	.1225
Texas M	lb.	.0740	.1225
Witco Disperso No. 1	lb.	.0740	.1225

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42	lb.	.0740	.1225
Continental AA	lb.	.0740	.1225
Croflex 77	lb.	.0740	.1225
Dixiedensed 77	lb.	.0740	.1225
Kosmobile 77	lb.	.0740	.1225
Micronex W-6	lb.	.0740	.1225
Spheron 9	lb.	.0740	.1225
Texas E	lb.	.0740	.1225
Witco Disperso No. 12	lb.	.0740	.1225
Wyex	lb.	.0740	.1225

Channel, Conductive (CC) (bags)

Continental R-40	lb.	.1800	.2400
Dixie 5 Dustless	lb.	.1200	.1900
Dixie Voltex	lb.	.2300	.3000
Kosmink Dustless	lb.	.1200	.1900
Kosmos Voltex	lb.	.2300	.3000
Spheron C	lb.	.1400	.1850
Spheron I	lb.	.1200	.1650
Spheron N	lb.	.2500	.2900
Voltex	lb.	.2300	.3000

Conductive Furnace Black (CFB) (bags)

Aromex 115	lb.	.0890	.1290
Shawinigan Acetylene Black	lb.	.1700	.2600
Vulcan C	lb.	.1100	.1530

Furnace, Fast Extruding (FEF) (bags)

Arovel	lb.	.0600	.1000
Croflex 50	lb.	.0600	.1000
Dixie 50	lb.	.0600	.1000
Kosmos 50	lb.	.0600	.1000
Philblack A	lb.	.0600	.1000
Statex M	lb.	.0600	.1000
Sterling SO	lb.	.0600	.1000

Furnace, General Purpose (GPF) (bags)

Sterling V	lb.	.0500	.0900

Furnace, High Modulus (HMF) (bags)

Collocarb	lb.	.0550	.0950
Continex HMF	lb.	.0550	.0950
Croflex 40	lb.	.0550	.0950
Dixie 40	lb.	.0550	.0950
Kosmos 40	lb.	.0550	.0950
Modulex	lb.	.0550	.0950
Statex 93	lb.	.0550	.0950
930	lb.	.0470	.0870
Sterling L	lb.	.0550	.0950
LL	lb.	.0550	.0950

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF	lb.	.0400	.0800
Croflex 20	lb.	.0450	.0850
Dixie 20	lb.	.0450	.0850
Essex	lb.	.0450	.0850
Furnex	lb.	.0450	.0850
Gastex	lb.	.0500	.0900
Kosmos 20	lb.	.0450	.0850
Pelletex	lb.	.0450	.0850
NS	lb.	.0450	.0850
Sterling NS	lb.	.0450	.0850
Sterling R	lb.	.0500	.0900
Sterling S	lb.	.0450	.0850

Furnace, Fine (FF) (bags)

Statex B	lb.	.0650	.1050
Sterling 99	lb.	.0650	.1050

Furnace, High Abrasion (HAF) (bags)

Aromex	lb.	.0790	.1250
115	lb.	.0790	.1190
Continex HAF	lb.	.0790	.1250
Croflex 60	lb.	.0790	.1175
Dixie 60	lb.	.0790	.1175
Kosmos 60	lb.	.0790	.1175
Philblack O	lb.	.0790	.1190
Statex R	lb.	.0790	.1250
Vulcan 3	lb.	.0790	.1220

Furnace, Super Abrasion (SAF) (bags)

Aromex 125	lb.	.1100	.1500
Dixie 70	lb.	.1100	.1550
Kosmos 70	lb.	.1100	.1550
Philblack E	lb.	.1350	.1750
Statex 125	lb.	.1100	.1550
Vulcan 9	lb.	.1350	.1780

Furnace, Super Abrasion, Intermediate (ISAF) (bags)

Philblack I	lb.	.1100	.1500
Vulcan 6	lb.	.1100	.1530

Furnace, Super Conductive (SCF) (bags)

Vulcan SC	lb.	.1800	.2230

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Thermal, Fine (FT) bags)

P-33 (c.l.)	lb.	——	.0550

Thermal, Medium (MT) (bags)

Shellblack *	lb.	——	.0250
Sterling FT	lb.	——	.0550
MT (c.l.)	lb.	——	.0350
Thermax (c.l.)	lb.	——	.0350
Thermax, Stainless (c.l.)	lb.	——	.0450

REINFORCING AGENTS—SILICA

Hi-Sil	lb.	.10	.11½
C	lb.	.11	.12½
Santocel	lb.	.62	.64

REINFORCING AGENTS—MISCELLANEOUS

Angelo Shellac	lb.	.30	.40
Darex Copolymer No. 3	lb.	.47	.49
X34	lb.	.42	.44
43G	lb.	.42	.44
Darex Copolymer Latex No. 3-L (and X34L)	lb.	.36½	.39
Durez 12687 (and 12707)	lb.	——	.37
Durez 13355	lb.	——	.29½
Good-Rite Resin 50	lb.	.42	.44
Hetro	lb.	.31½	.32½
Kralac A	lb.	.43	.44
Lampblack	lb.	——	.12
Marbon S and S-1	lb.	.42	.49
8000	lb.	.42	.49
Marmix	lb.	.42	.49
Pliolite Latex 150	lb.	.44	.45
Pliolite Resin-Rubber Masterbatches	lb.	.35	.50
Pliolite NR	lb.	.99	1.00
Pliolite S3, S6, and S6B	lb.	.43	.44
Polyco 220	lb.	.18¼	.19¼
Zeolex 20	ton	120.00	140.00

RETARDERS

Dutch Boy Normasal	lb.	——	.46
ESEN	lb.	.35	.37
Harcopol 1183	lb.	.70	.74
Retarder ASA	lb.	——	.57
Retarder PD	lb.	.35	.37
Retarder W	lb.	——	.45
Retardex	lb.	.47	.50

RUBBER SUBSTITUTES

Mineral Rubber

38	ton	38.00	40.00
Black Diamond	ton	38.00	40.00
Byerlyte	ton	47.00	54.00
Gilsonite, Selects (c.l.)	ton	37.00	38.00
Hard Hydrocarbon (dms.)	ton	46.50	48.50
Herron Flake	ton	——	45.00
Mineral Rubber, solid	ton	42.50	44.50
Pioneer	ton	35.00	46.00

Vulcanized Vegetable Oils (Factice)

Amberex	lb.	.29	.36
Brown	lb.	.1220	.2200
Neophax	lb.	.1570	.2680
White	lb.	.1480	.2560

Miscellaneous Rubber Substitutes

G.B. Asphaltenes	lb.	.06	.06½
Gilsowax B	lb.	09	.11
Resin No. 1098 (drums)	lb.	——	.62
No. 1198	lb.	.46¾	.49¾

SOLVENTS

Acetone (dlvd.)	lb.	.10½	.11¼
American Dipentine	gal.	.44½	.68
American Pine Oil	gal.	.75¼	.95¼
Amsco Lactol Spirits (t.c.)	gal.	——	.18
Naphthol Spirits	gal.	——	.18
Mineral Spirits	gal.	——	.16
Rubber Solvent (t.c.)	gal.	——	.17
Solv A (t.c.)	gal.	——	.25½
Solv A-80 (t.c.)	gal.	——	.30½
Solv B (t.c.)	gal.	——	.29
Solv B-90 (t.c.)	gal.	——	.32
Solv D (t.c.)	gal.	——	.30½
Solv E	gal.	——	.29½
Solv F	gal.	——	.30½
Solv F-80	gal.	——	.34½
Special Naphtholite (t.c.)	gal.	——	.17
Special Textile Spirits	gal.	——	.18
Super Naphtholite	gal.	——	.17
Textile Spirits (t.c.)	gal.	——	.18
Amyl Chlorides, Mixed (l.c.l.) (drums)	lb.	.09¼	.10¼
Benzol 90%	gal.	——	.48
Butyl Acetate (t.c.)	lb.	.15	.16
Butyl Alcohol (t.c.)	lb.	.15	.16
Secondary (dlvd.)	lb.	.13	.14
Tertiary (dlvd.)	lb.	12	.14½
Carbon Bisulfide, Tech	lb.	.05¼	.08½
Carbon Tetrachloride	lb.	.08¼	.09¼
Cosol 1	gal.	.37	.43
Cosol 2	gal.	.42	.48
Cyclohexane	gal.	.55	.72
Cyclohexanone	lb.	.25	.27*
Diacetone, Pure (dlvd.)	lb.	.14	.15
Dichlorethyl Ether (dms.)	lb.	.13	.15
Formal (dms.)	lb.	.29¾	.31¼
Dichloropentane	lb.	.04¼	.14¾
Dicom	gal.	.30	.42
Halowax Oil	lb.	.28	.41
Heptanes (t.c.)	gal.	.17	.22
Hexalin Cyclohexanol	lb.	.20	.22*
Hexanes (t.c.)	gal.	.17	.22

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Write for Bulletin A-10.

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SOLVENTS (Cont'd)

Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.59	.66
Ether, Ref. (dlvd.)	lb.	.05	.08
Mersol	gal.	.43	.79
Mesityl Oxide (dlvd.)	lb.	.13½	.14½
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.54½	.72¼
Methyl Ethyl Ketone	lb.	.13	.14
Methyl Isobutyl Ketone (dlvd.)	lb.	.15	.16
N-5 Pentane Mix. (t.c.)	gal.	—	**.13½**
N-6 Hexanes (t.c.)	gal.	—	.14½
N-7 Hexanes (t.c.)	gal.	—	.13½
Penetrell	gal.	.44½	.68
Petrolene (t.c.)	gal.	—	**.13125**
Picolines, Alpha, Refined	lb.	.44	1.00
Mixed	lb.	—	.34
Proprietary Solvent (dms.)	gal.	.51	.72
PT 150 Pine Solvent (dms.)	gal.	—	.44
Pyridine, Refined	lb.	—	1.15
Quinoline	lb.	.60	1.45
Rubber Solvent (t.c.)	gal.	—	**.16**
Ruhsol (t.c.)	gal.	—	**.11875**
Skellysolve B (Hexanes) (t.c.)	gal.	—	.158
C (Heptanes) (t.c.)	gal.	—	.151
E (Octanes) (t.c.)	gal.	—	.165
R (Solvent Naphtha)	gal.	—	.129
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100 (t.c.)	gal.	—	**.28**
150 (t.c.)	gal.	—	**.28**
Sunny South Dipentine	gal.	.44½	.68
Sunny South Pine Oil	gal.	.75½	.95½
Sunray	gal.	.1140	.1600
Toluene (drums)	gal.	—	**.28**
Toluol (t.c.)	gal.	—	.45
Trichlorethane	lb.	.11½	.13½
Triglycol Dichloride (dms.)	lb.	.63	.64
Union Thinner 1	gal.	—	.183
3	gal.	—	.183
5	gal.	—	.173
7	gal.	—	.173
2-50-W Hi-Flash	gal.	—	.41
X-7 Sp. Heptanes (t.c.)	gal.	—	**.11**
Xylol	gal.	—	.45

STABILIZING AGENTS (for Vinyl Resins)

Advastab No. 21	lb.	—	1.08
Barca 10	lb.	—	.80
Basic Silicate White Lead	lb.	.17¾	.18¼
Bunatak Polymer No. 780	lb.	—	.04
No. 5514	lb.	—	.35
BVS	lb.	—	.73¼
Cadmium Stearate	lb.	1.40	1.44
Dutch Boy DS-207	lb.	—	.54
Plumb-O-Sil A	lb.	—	.29¾
B	lb.	—	.31¼
Tribase	lb.	—	.27½
Dythal	lb.	—	.41
Ferro 120 (dms.)	lb.	.73¼	.83¼
121 (dms.)	lb.	.68	.78
200 (dms.)	lb.	1.33	1.43
211 (dms.)	lb.	.65	.75
221 (dms.)	lb.	1.51	1.61
541 (dms.)	lb.	.35½	.45½
541A (dms.)	lb.	.81¾	.91¾
620 (dms.)	lb.	—	.77½
700 (dms.)	lb.	.48¾	.58¾
900 (dms.)	lb.	1.02¾	1.12¾
903 (dms.)	lb.	.65	.75
909 (dms.)	lb.	1.02¾	1.12¾
920	lb.	—	.98
931 (dms.)	lb.	.75¾	.85¾
1820 (dms.)	lb.	.90	1.00
Harshaw 1-V-3	lb.	.43	.58
1-V-4	lb.	.74	.89
2-V-4	lb.	1.19	1.29
2-V-7	lb.	1.24	1.34
2-V-8	lb.	1.44	1.59
5-V-1	lb.	.41	.56
5-V-2	lb.	.44	.59
7-V-1	lb.	.95	1.05
7-V-2	lb.	1.00	1.15
8-V-1	lb.	1.23	1.33
8-V-3	lb.	.60	.70
8-V-5	lb.	.93	1.03
9-V-1	lb.	.89	.99
9-V-2	lb.	.45	.60
12-V-5	lb.	.90	1.05
128-V-5	lb.	.86	1.01
Lead Stearate No. 102	lb.	.33	.34
Lead Stearate, Precip.	lb.	.32	.44
Fused	lb.	—	.37
Lithium Stearate	lb.	.62	.67
Modicol N	lb.	.41½	.42½
S	lb.	.30⅜	.31⅜
Stabelan E	lb.	1.39	1.50
XL	lb.	.60	.70
G	lb.	.85	.95
HR	lb.	1.25	1.40
Stabilizer No. 3	lb.	—	2.05
Stabilizer No. 42	lb.	—	.85
Stabilizer No. 52	lb.	—	2.05

STABILIZING AGENTS (Cont'd)

Stabilizer No. 89X	lb.	—	.75
Stabilizer No. 143	lb.	—	.85
Stabilizer BC-12	lb.	—	.90
Stabilizer B-5	lb.	—	.70
Sodium Silicates	cwt.	1.00	5.25
Stabilizer CH-14	lb.	—	.65
Stabilizer CH-20	lb.	—	.65
Stabilizer E6B	lb.	—	.95
Stabilizer E-49	lb.	—	.60
Stabilizer E-98	lb.	—	.55
Stabilizer G-1	lb.	1.25	1.40
Stabilizer HR	lb.	.85	.89
Stabilizer JCX	lb.	—	.63
Stabilizer L	lb.	—	.60
Stabilizer OM-10	lb.	—	2.05
Stabilizer OM-18	lb.	—	3.55
Stabilizer SN	lb.	—	.48
Stabilizer V-1-N	lb.	—	.43
Stabilizer VL-3	lb.	—	1.00
Stabilizer V-7939	lb.	—	**.60**
Staflex OY	lb.	—	1.20
QXMA	lb.	—	.70
Staycin 1	lb.	—	.65
Vanstay L	lb.	.33	.35
H	lb.	.75	.77
H.T.	lb.	.90	.92
S	lb.	.65	.70

STIFFENING AGENTS

Calco S.A.	lb.	.85	.88

SUN CHECKING AGENTS

Allied AA-1177	lb.	.15½	.16½
Antisol	lb.	—	**.23**
Antisun	lb.	—	.18½
Heliozone	lb.	.26	.27
NBC	lb.	—	1.55
Sunolite	lb.	.21	.23
Sunproof 713	lb.	.25	.26
Imp.	lb.	.25	.26
Jr.	lb.	.20	.21
Tonox	lb.	.52	.54

SURACE ACTIVE AGENTS

Aquarex D	lb.	—	.78
MDL	lb.	—	.33
ME	lb.	—	.94
NS	lb.	—	.60
SMO	lb.	—	.50
WAQ	lb.	—	.25
Emulphor EL-620	lb.	—	.39½
Igepal CO-730	lb.	—	.36
CO-850	lb.	—	.38
CO-880	lb.	—	.38
Igepon CN-42	lb.	—	.25
T-77	lb.	—	.53

TACKIFIERS

Arcco 620-32B	lb.	.20	.21
716-30	lb.	.18	.19
1041-21	lb.	.16½	.17½
Galex (drums)	lb.	.15½	.19¼
Indopol H-300	gal.	1.00	1.21
Koresin	lb.	—	.95
Liquid Rubber Flux	lb.	—	.14
Nilox (c.l.)	cwt.	—	14.50
Resin V	lb.	—	.23½
Rubtack	lb.	—	**.12**
Synthol	lb.	—	.24¼
Tackifier 1041-21	lb.	.16½	.17½
Vistac No. 1	gal.	1.00	1.21
A	lb.	.21½	.22¼
Zirex (c.l.)	cwt.	—	14.75

THICKENERS (FOR LATEX)

Alcogum AN-6	lb.	—	.0[illegible]
AN-10	lb.	—	**.08¼**
Betanol (drums)	lb.	—	**.70**
Emulsorex No. 5	lb.	—	**.35**
Good-Rite K-702	lb.	.34½	.55
K-704	lb.	.21	.22
K-705	lb.	.31	.32
K-707	lb.	.18	.19
K-708	lb.	.29	.30
K-710	lb.	.15	.16
Lecithin	lb.	.12	.17
Modicol VD	lb.	.13⅜	.14⅜
VE	lb.	.13⅜	.14⅜
Polyco 296 BT	lb.	.15	.16
296-N	lb.	.15	.16
530	lb.	.15	.16
Propylene Laurate (dms.)	lb.	**.57**	**.67**
Sodium Silicates	cwt.	1.00	5.25

VULCANIZING AGENTS

Selenium

Vandex	lb.	—	4.75

VULCANIZING AGENTS (Cont'd)

Sulfur

Blackbird (c.l.)	cwt.	—	2.85
Cloud	cwt.	—	3.00
Crystex	lb.	.19½	.23
Darex Dispersed Sulfur	lb.	.14	.16
Devil A (c.l.)	cwt.	—	2.40
Dispersed Sulfur	lb.	.14	.16
Insoluble Sulfur 60	lb.	12½	.13
Ko-Blend IS	lb.	—	.38½
Mist (Wettable)	cwt.	—	4.00
Spider	cwt.	—	3.00
Star (c.l.)	cwt.	—	3.25
Sulfasan R	lb.	—	1.50
Tire (c.l.)	cwt.	—	2.40
Tube	cwt.	—	3.25
Vultac 2	lb.	.47	.74
3	lb.	.51	.78

Tellurium

Telloy	lb.	—	2.50

WETTING AGENTS

Advawet No. 10	lb.	—	.20
No. 33	lb.	—	.48
Aerosol 18	lb.	—	.40
AY	lb.	1.00	1.25
MA	lb.	1.00	1.25
OT 70% Clear	lb.	.80	1.00
OT 100%	lb.	1.00	1.50
Alrosol (dms.)	lb.	—	**.40**
Alrosperse	lb.	—	**.18**
Areskap 50	lb.	.30	.38
Dry 100	lb.	.60	.72
Aresket 240	lb.	.30	.38
Dry 300	lb.	.60	.72
Aresklene 375	lb.	.42	.57
Armacs	lb.	.29	.76
Arquads	lb.	**.21**	**.61**
Emcol 5100 (dms.)	lb.	—	.37
5130 (dms.)	lb.	—	.40
Etho-chemicals	lb.	.34	.80
Kessco E-122 (dms.)	lb.	—	.49
Kreelon 4G (bags)	lb.	.132	.155
8G (dms.)	lb.	.28	.30
Lecithin	lb.	.13	.17
Modicol N	lb.	.41½	.42½
S	lb.	.30⅜	.31⅜
Orvus Extra Granules	lb.	.15	.16
Nekal NS	lb.	—	.28
Nopco 1086-A	lb.	.39½	.40½
1187-X	lb.	.15	.16
Parnol	lb.	**.13**	**.18**
Pluronic L-62	lb.	.38½	.42½
Selapon Gel	lb.	—	.13
Santomerse D	lb.	.44	.65
S	lb.	.13	.25
Sotapon SF-73	lb.	—	.18
SF-78	lb.	—	.30
SF Conc.	lb.	.29	.30
Sorbit P	lb.	—	**.25**
Stablex G	lb.	**.50**	**.70**
Tergitol 4 (dms., dlvd.)	lb.	.30	.31
7 (dms., dlvd.)	lb.	.43	.44
O8 (dms., dlvd.)	lb.	.30	.31
P28 (dms., dlvd.)	lb.	.18½	.19
Trenamine W-30	lb.	—	**.15**
Vultamol	lb.	—	.17¾
Wetsit Conc.	lb.	.25	.28

MISCELLANEOUS CHEMICALS

Aquarex G	lb.	—	.21
Aquasperse 30	lb.	—	.11
Arccopel W-18	lb.	—	.18
Copper Inhibitor X-872-L	lb.	—	2.01
D-Tac	lb.	—	.22
2-Ethylhexanol	lb.	.27¾	.29¾
Fura-Tone Resin 1226	lb.	.41	.43
Gen-Tac Resin	lb.	—	.42
MODX	lb.	.29½	.31½
Nullapon BF-12	lb.	—	.20½
BF-13	lb.	—	.26½
BF-78	lb.	—	.61½
Para Resin 2457	lb.	.04	.04½
2702	lb.	.04	.04½
2718	lb.	.04	.04½
Pigmented Filmite (dlvd.)	lb.	—	.16¾
Resorcin, Tech.	lb.	.77½	.78½
Rio Resin	lb.	.60	.62
Rongalite CX	lb.	—	.24
Sherosope F	lb.	.17	.17¼
F-445	lb.	.17	.17¼
L	lb.	.18	.18¼
N	lb.	.18	.18¼
T	lb.	.18	.18¼
Sublac Resin PX-5	lb.	.23½	.24½
Sulfasan R	lb.	—	1.50
Synpep	lb.	.54	.60
Thiokol LP-2	lb.	.96	1.06
LP-3	lb.	.96	1.06
Tysonite	lb.	.24	.24¾
Vanfre	gal.	2.50	3.00

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Copy for November, 1953, issue, must be received by Monday, November 2nd.

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ORGANIC CHEMIST: M. S., 2 years industrial rubber research—patent application. Desire research or development position in rubber or polymer industry. 25, married, child. N. Y. C. and vicinity. Address Box 771-P, RUBBER AGE.

POSITION WANTED—seven years experience in carbon black industry in supervision of testing and evaluation laboratories. Experience includes development, customer service problems, production quality in both rubber and color black laboratories. Address Box 773-P, RUBBER AGE.

CHIEF CHEMIST—Thirteen years experience in industrial, latex, and pressure-sensitive adhesives, resins, protective coatings seeks commensurate position in development or technical service. Presently engaged. Minimum salary $12,000. Address Box 745-P, RUBBER AGE.

PLANT SUPERINTENDENT-CHEMIST, 10 years experience in rubber, and management. Qualified production executive. Knows coatings, casting compounds, solvent and water based adhesives and cements; natural and synthetic latex and rubbers; also milling and curing operations. Can set up factory equipment and laboratory controls. Will accept sales or technical sales. Interested in top level executive position. Can relocate. Will also accept foreign employment. Address Box 764-P, RUBBER AGE.

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SUPERINTENDENT, chemist—desires opportunity to become production manager and eventually factory manager. Years of broad practical-technical experience in all of the phases for the production of mechanical rubber and sponge goods is my background. Address Box 776-P, RUBBER AGE.

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Help Wanted continued on next column⟶

HELP WANTED—Continued

CHEMIST: Graduate chemist preferably with rubber footwear experience for development and control work. Midwestern location. Congenial group. Compensation commensurate with experience. Address Box 766-W, RUBBER AGE.

CHEMIST skilled in compounding for industrial rubber products principally belting, hose, molded and sheet rubber products; in Cincinnati, Ohio area. Long established company with outstanding products reputation. Address Box 740-W, RUBBER AGE.

DEVELOPMENT CHEMIST: Recent graduate chemist with or without rubber experience for both pilot and plant development work. Midwestern location. Pleasant working conditions. Address Box 767-W, RUBBER AGE.

RUBBER PRODUCTS DEVELOPMENT
TECHNICAL DIRECTOR
Port Clinton, Ohio, Division

Reports to Director of Engineering and Research. Must have heavy experience in rubber compounding, curing, adhesives, laminations, physical and chemical characteristics; design of rubber parts in connection with extrusions and molds. Operate and expand laboratory.

Must have a Chemical Engineering or Chemistry Degree from a recognized school.

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Submit resume in full to Director of Engineering and Research, STANDARD PRODUCTS CO., 2160 Halstead Ave., Cleveland 7, Ohio.

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CHEMIST

Ohio manufacturing plant desires a chemical engineer or chemist experienced in the development of latex compounds for foam rubber products. Write giving experience and training. Address Box 774-W, RUBBER AGE.

CHEMIST

A New England mechanical rubber goods company has opening for a chemist, experienced in mechanical goods production and development. Send resume and salary requirements. Address Box 770-W, RUBBER AGE.

Help Wanted continued on next page⟶

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AKRON 14, OHIO

Manufacturers of
ALUMINUM FLAKE

A colloidal hydrated aluminum silicate. Reinforcing agent for natural, synthetic and reclaimed rubber.

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CHEMIST

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For MAXIMUM returns at minimum cost,
advertise in the Classified columns of
RUBBER AGE

WANTED: Rubber mills, calenders, mixers, Banbury mixers, extruders, grinders, cutters, hydraulic presses, injection molding machines. CONSOLIDATED PRODUCTS CO., INC., 14-17 Park Row, New York 38, N. Y.

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CALENDERING & MIXING

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Vol. 73

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FOR your RUBBER PROCESSING MACHINERY NEEDS

BUYS OF THE MONTH ★

HYDRAULIC PRESSES · MILLS
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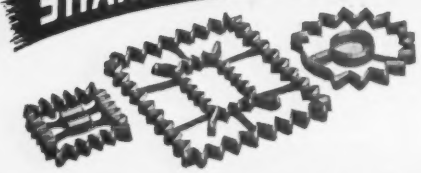

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